COAL AGE

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What the Coal Strike is About

By R. Dawson Hall

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WHAT is the coal strike about? The kindest, perhaps the truest, explanation of the great strike may be embodied in the words that it is a protest against the irregular working of the high-cost mines that are producing low-grade coal and an aspiration that these mines may be enabled to work steadily, or at least more steadily, than before and if not that they will pay the men more than under the old scale.

For many of the men the strike appears likely to be wholly a failure. One is sorry to admit that for these, the more unfortunate mine workers, it is so entirely lost. The mine workers in the inefficient low-grade mines are worse off than if it had not occurred. The new scale and it seems that it is accompanied by price regulation, will make matters worse instead of better. The future is darker than the past, if the operators are to bear any part, or all of the burden of the wage increase.

Price regulation will prevent the high-cost low-grade mine from working at all as soon as the press for tonnage is at an end. The miners where the demand for a repudiation of the contract on Nov. 1 arose will shut down tight as soon as the needs of the public are in any degree satisfied. For the prices of the low-cost high-grade coal will be kept low by regulation, and the public will satisfy its needs from the mines that produce it and work in the other mines will be impossible.

True, these mines can ask the high prices granted during the war, but they can only work so long as the shortage exists, for none can be compelled to pay the high price conceded to these operators. As soon as the shortage is assuaged they must close down. Dr. Garfield has explained that what he is doing is bringing his "bulk lines" nearer the cost of production and so putting mines out of operation. The new adjustment will close ill-equipped high-cost mines in greater numbers than before.

Instead of mines capable of six hundred million tons being allowed to work, only sufficient mines to produce five hundred million are to be permitted to operate. In fact more will close than Dr. Garfield imagines, for the bulk lines during the war were based on steady work and on the patriotic endeavor of the workingmen.

Those bulk lines will now be below the producing cost of more mines by reason of the 14 per cent wage increases and below still more, by reason of the unsteady work and low productive effort of the workmen now obtaining. Thus they will rule out more mines than Dr. Garfield imagines.

The strike falls more heavily on the malcontents than it does on those who were only led to complain by the example of those who were discontented. The action of John L. Lewis and William G. McAdoo in protesting against the operators earnings has been distinctly unfortunate, for it has sounded the death-knell for the pick miner and the mule driver in the small mine, the men who, being most in trouble, vociferated most loudly and most naturally for relief.

The cause is lost at least by those with whom we have most sympathy. Had the mine workers not tried to put the burden on the operator, a degree of victory—a real 20 or 25 per cent betterment—might have been won for all the mine workers in fortunate and unfortunate mines alike.

The inefficient mine is doomed. The public will see its end without regret, but its closing will mean no little hardship to those who through years of hope against hope have cast their fortunes on its success. They have gambled with the progressive spirit of the present—and lost. How long will it take them to learn that the effort was illspent?

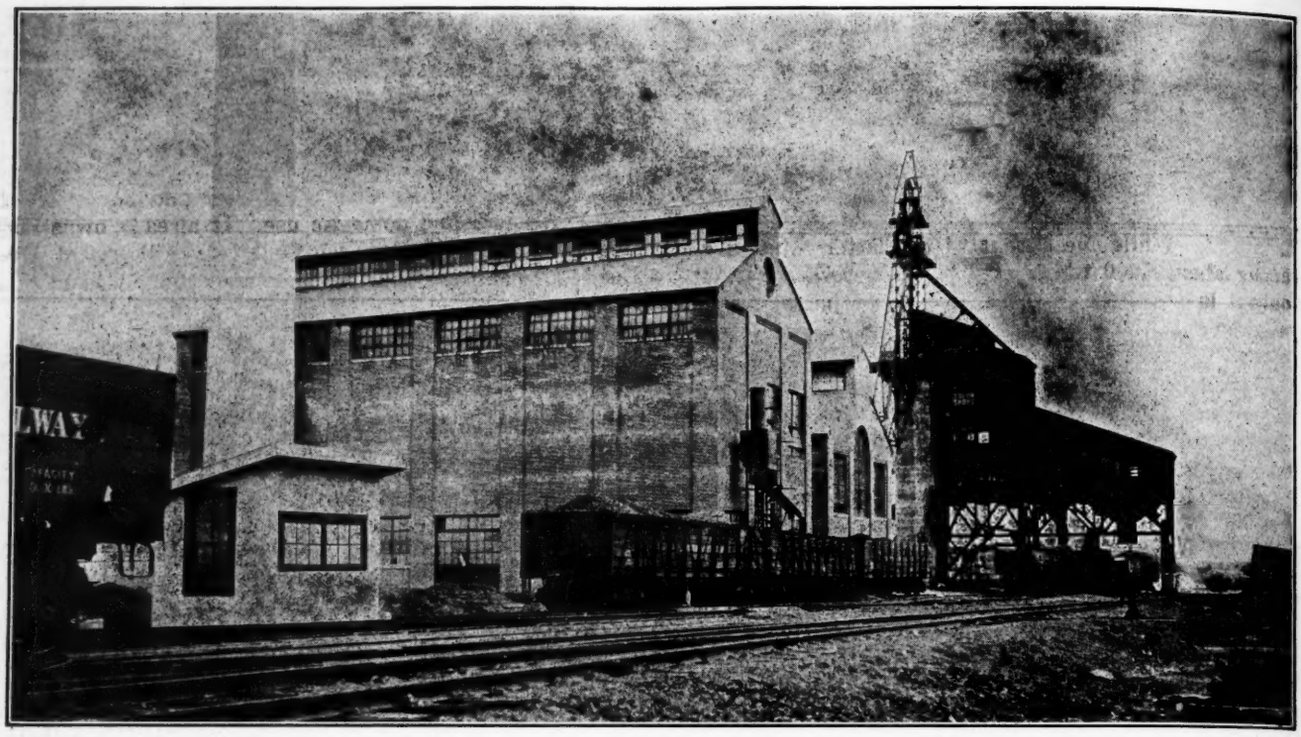

FIG. 1. POWER HOUSE AND TIPPLE AT THE SUPERIOR NO. 4 OPERATION

Engineering Features of Modern Large Coal Mines in Illinois and Indiana*—I

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The concrete tipple of the Kathleen mine is an innovation in the southern Illinois field. The preparation plants of the various mines here described vary widely in detail, yet all embody simple apparatus of proved utility. The housing of employees has received careful attention in at least one instance.

WITHIN the past few years, considerable development has been made in the coal-mining industry in Illinois and Indiana and it is the purpose of the authors to record its most important phases. Perhaps the two most striking features are the entry into the producing fields of certain large consumers of coal and the magnitude of some of the new operations. Mines are now being equipped by the Chicago & Northwestern R.R., the Chicago, Burlington & Quincy R.R., the Standard Oil Co. of Indiana and the Union Electric Light and Power Co., of St. Louis. Besides these the U. S. Steel Corporation has increased its coal-mining activities by commencing operations on its large holdings northeast of Benton, Franklin County, Illinois.

Until recent years the supply of commercial coal has commonly been adequate and prices have generally been favorable, especially to large consumers, as the magnitude of their purchases enabled them to obtain satisfactory quotations from producers. In fact, many large consumers of coal have believed that they could buy their fuel more satisfactorily in the open market than they could produce it themselves. The entry of the United States into the war was accompanied by various disarrangements of industrial conditions, and a demand for coal in excess of the supply seemed likely to be experienced for an indefinite period. Under these circumstances it seemed that the greatest assurance of a supply of fuel was its production by the operation of mines. In the case of the Chicago & Northwestern R.R. and the U. S. Steel Corporation, the production of coal has been carried on for many years with satisfactory results, but the Chicago Burlington & Quincy R.R., the Union Electric Light and Power Co. and the Standard Oil Co. of Indiana had not been producers of coal, at least in this district.

Apparently the most impressive feature of the newest mines is their capacity, for in some cases it is planned that production shall be in the neighborhood of 1000 tons per hour. There are mines now in this field having nearly that output, but these were not planned for such a production; in fact, when the shafts were sunk and the machinery installed it was generally supposed that the daily outputs would be only in the neighborhood of 4000 to 5000 tons. Incidentally, there has risen an interesting rivalry among some of the mines of large output. For a few years, the record for a day's output from a shaft mine in the bituminous

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coal districts of the United States, and probably in the world, was held alternately by the No. 3 mine of the Superior Coal Co., at Gillespie, and the No. 1 mine of the New Staunton Coal Co., at Livingston. Subsequently the contest passed to the south and the record was held alternately by the Orient mine of the Chicago, Wilmington & Franklin Coal Co., at Orient, Ill., and the No. 1 mine of the American Coal Mining Co., at Bicknell, Ind. While the output of the latter mine is generally above 5000 tons per day, the record for a day's output is now held by the former mine, at which there was hoisted, on Mar. 6, 1919, 6776.75 tons in 1501 hoists.

No attempt has been made to chronicle any but the most important phases of recent events. Many new mines have been sunk and equipped in the past few years but these have not been discussed unless some new features of engineering practice were involved. For the purposes of this article six mines have been selected as exhibiting the most striking recent developments. These are the No. 2 mine of the Standard Oil Co., the No. 4 mine of the Superior Coal Co., the Kathleen mine of the Union Colliery Co., the No. 2 mine of the Bell & Zollar Mining Co., the Valier mine of the Valier Coal Co., and the No. 2 mine of the American Coal Mining Co. These mines are located as follows: Standard Oil Co. of Indiana, Mine No. 2, at Schoper, 8 miles northeast of Carlinville, Macoupin County, Illinois; Superior No. 4, 7 miles southwest of Gillespie, Macoupin County, Illinois; Kathleen mine of the Union Colliery Co., 5 miles south of DuQuoin, Perry County, Illinois; Bell & Zoller No. 2, 1½ miles southwest of Zeigler, Franklin County, Illinois; Valier mine of the Valier Coal Co., 3 miles north of Christopher, Franklin County, Illinois; No. 2 mine of the American Coal Mining Co., about 2½ miles southeast of Bicknell, Indiana.

These mines are the properties of companies unrelated to each other. In each case the plans have been made by engineers of experience in coal mining and of perfect familiarity with the conditions to be met. These mines, therefore, embody the best knowledge and experience obtainable and represent the highest type of coal-mine engineering in the district at the present time.

The Standard Oil Co. of Indiana is a new operator. To provide fuel for its refineries at Wood River, Kansas City and Whiting, which together consume about 7000 tons of coal every day of the year, the company purchased the old mine of the Carlinville Coal Co., at Carlinville, with about 2300 acres of coal lands, and also about 22,000 acres of undeveloped coal lands lying to the north and east of Carlinville.

The Superior Coal Co. is a subsidiary company of the Chicago & Northwestern R.R. It first entered the Illinois coal fields about 14 years ago and already had three mines in operation near Gillespie, the combined output being about 12,000 tons a day. The coal rights of the company include nearly 45,000 acres in the Gillespie field.

The Union Colliery Co. is a subsidiary of the Union Electric Light and Power Co., of St. Louis, which in turn is a subsidiary of the North American Co. The latter company is already interested in coal mining in Ohio and Kentucky. Coal from the Kathleen mine will be supplied to power plants in St. Louis and Milwaukee and to the open market.

The Bell & Zoller Mining Co. is a producer and marketer of coal for steam and domestic use. The company has mines at Centralia and Zeigler, the latter mine being the largest and best known.

The Valier Coal Co. is a subsidiary of the Chicago, Burlington & Quincy R.R., and its coal will go entirely to that consumer.

The American Coal Mining Co. of Indiana is, like the Bell & Zoller Mining Co., a producer and marketer of coal for steam and domestic use. It already owns and operates its No. 1 mine, which is one of the most productive operations in the bituminous-coal fields of the country.

In the case of each of the Illinois mines under consideration, the coal developed is the well-known No. 6 bed, which is the principal measure worked south of Springfield. The characteristics of this coal are not the same at all of the mines considered.

The two mines lying farthest north, Standard Oil No. 2 and Superior No. 4, are in coal that, at the former,

TABLE I. DATA OF MINES DISCUSSED

Name of Operator	Name of Mine	Approximate Output Expected per Day, in Tons	Thickness of Coal, in Feet	Depth of Hoisting Shaft to Bottom of Coal, in Feet	Inside Dimensions of Hoisting Shaft, in Feet	Inside Dimensions of Air Shaft, in Feet
Standard Oil Co. of Indiana.....	No. 2 (Schoper)	7000	6 to 8	317	7 by 17	14 by 31
Superior Coal Co...	No. 4	7000	average 7½	313	11 by 21	11 by 17
Union Colliery Co.	Kathleen	7000 to 8000	average 8½	261	11 by 19	12½ by 26½
Bell & Zoller Mining Co.....	No. 2	6000	average nearly 11	310	12 by 21½	12½ by 22½
Valier Coal Co....	Valier	7000 to 8000	9½ to 12½	605	11 by 18½	13 by 30
American Coal Mining Co.....	No. 2	7000	average 6½	248	12 by 20	12 by 18

varies from 6 to 8 ft. in thickness and at the latter averages 7 ft. 1½ in. with about the same limits. In this northern part of the district, the coal is nearly horizontal and there is no reason for anticipating serious trouble from grades, as the mines already developed have not encountered serious difficulty from this cause. As far as the experience in the district indicates, there will be no trouble from gas, at least at the Standard mine, but the Superior No. 4 approaches so close to the Staunton natural-gas field that inconvenience from this source is possible. The roof conditions in this district are, in general, very good and it is the practice of the Superior Coal Co. to drive its entries and crosscuts 21 ft. wide in order to avoid payment for narrow work. In some cases this is not possible and the present development of the No. 4 mine indicates that the entries in part of the mine cannot be made more than from 15 to 18 ft. wide.

The Kathleen mine is situated near the bottom of the monoclinal fold, commonly known as the DuQuoin anticline, which passes a little east of north across the eastern side of Perry County. The shaft of the Security mine on the west side of the fold is 90 ft. deep, while those of the Paradise and Majestic mines on the east side are respectively 365 and 409 ft. Heretofore operations on the steep part of the slope have been avoided, though there have been some small workings.

After considerable exploratory work, the Union Colliey Co. decided to develop a property so situated that about one-third of the coal will be taken from the plateau on the west side of the fold, where the depth is about 90 ft. about one-third from the slope of the fold,

and about one-third from the east side where the average depth is about 250 ft. With such a topography of the coal bed, the location of the shaft required thorough consideration. Since the coal east of the steepest part of the fold continues to dip slightly to the east, the only position of the shaft that would have allowed a general down-grade from west to east would have been on or near the east boundary of the plot. This, however, would have required the development of a one-sided mine and the surface conditions would have been unfavorable.

Study of conditions led to the location of the shaft as far down the slope of the monocline as the surface would permit. Development of the underground working has shown that the bottom of the monocline was not reached but that the steep grade, approximately 5 deg., extends for a short distance to the east of the shaft. The larger part of the coal will travel down-grade but some will have to be hauled up an adverse inclination. The grade on this monocline has been found to average from 5.2 to 5.3 per cent. but is not constant, appearing rather as a series of steps in which flatter and steeper parts alternate.

Car Movement Under Mechanical Control

It will be necessary to use mechanical means to control the movement of the cars approaching the shaft when uncoupled from the locomotive. The average thickness of all sections of the coal thus far made at the Kathleen mine is 8 ft. 3½ in., the thickest coal being on the eastern side of the monocline. It is not expected that much water will be encountered as the other mines in the vicinity have no trouble from this cause unless the roof is broken by the removal of coal. Little difficulty from gas has been experienced in the neighboring mines.

In the case of the Bell & Zoller mine No. 2, the No. 6 coal is reached a little south of the famous Zeigler mine, which was the first opened in Franklin County and the one in which the thickest coal is found. It is now thought that the coal in the No. 2 mine will not have as great an average thickness as that at Zeigler, where it is close to 11 ft. and where as much as 15 ft. is found in places and the average thickness taken out is about 8½ ft. The coal at the new mine will, however, be thicker than most of the other coal of Illinois and a thickness of 8½ ft. can be mined as at Zeigler. The depth at the Bell & Zoller mine No. 2 is 310 ft. and the dip to the north is indicated by a depth of 450 ft. at the Zeigler mine of the same company about 2 mi. north of No. 2.

At the Valier mine, the depth to the bottom of the coal in the main shaft is 605 ft., this being one of the deep mines in the state. The shaft was located with an idea of avoiding an unusually thick layer of water-bearing material. Success was attained in this respect but the topography of the coal bed at the shaft bottom was found to be somewhat rough and considerable grading will be necessary. The thickness of the coal is somewhat variable, ranging from 9 ft. 6 in. to 12 ft. 2 in. so far as known. It is expected that a thickness of 8½ ft. will be taken out in the rooms. The mine gives off considerable gas, as do all of the operations in this part of the district. Electric lamps are used exclusively.

The coal being developed at the American No. 2 is the No. 5 bed of the Indiana series. The coal varies considerably in thickness in different parts of the field, averaging about 6½ ft. at the No. 2 mine. The coal bed lies generally horizontal, but some trouble is experienced from local hills and swamps. The coal contains many impurities and is not well suited to domestic purposes; it is a most excellent steam fuel and for this purpose finds its most ready market. The No. 5 bed has little or no water and has an excellent roof, but gives off large quantities of methane.

The high yield of coal planned for these mines has necessitated the sinking of shafts not only large enough to accommodate the necessary hoisting but to transmit the large volumes of air required for ventilation when the mines become fully developed. At the Standard mine, the main shaft is 7 x 17 ft. inside and 317 ft. deep. The lining is 3 x 10 in. timber laid flat above the solid rock, and 3 x 5 in. timber laid flat through the rock, all nailed with heavy spikes. The lining inside the timber will be of reinforced concrete 17

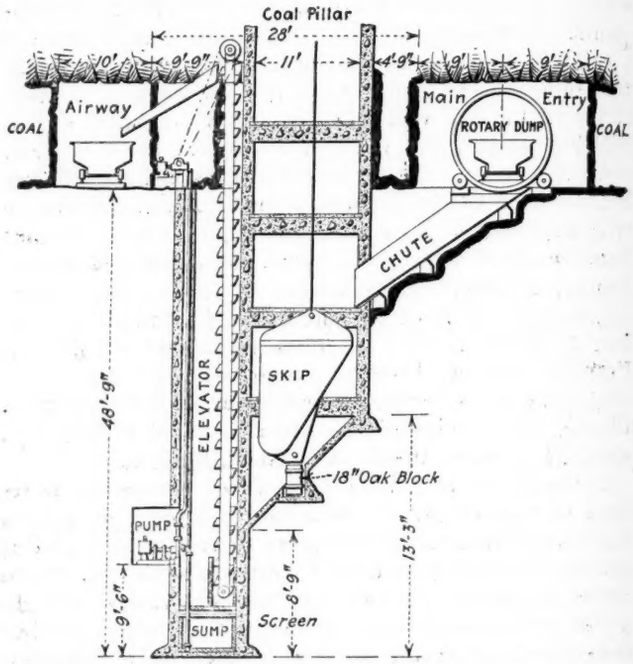


FIG. 2. ELEVATION OF SHAFT BOTTOM AT VALIER

in. thick from top to bottom. At all of the mines the concrete was mixed on the surface and lowered through pipes to the bottom, and in all cases, but one, the concreting was done from the bottom upward. At the Standard, the concrete was distributed from the bottom of a pipe to the periphery of the shaft through a flexible tubular chute similar to those used for handling grain, while at the Valier mine a rubber hose was employed. At the Kathleen mine the concrete was lowered through a 6-in. flanged-joint pipe and discharged into a metal telegraph, or baffle, to which was attached a flexible metallic elbow from which the concrete was carried to the forms through wooden chutes. At the Superior No. 4, wooden chutes, floored with metal under the pipe, were used for distributing the concrete.

Various kinds of shaft forms were used at these mines. Those at the Standard consisted of planks laid on edge and bound by corner pieces devised by the engineers for this work. The buntons are of concrete, poured in position as the lining was brought up. The forms for the lining at the Superior No. 4 were made of planks set on end and held by horizontal strips of 2 x 6-in. timber bolted together at the corners. A joint

in the middle of each timber permitted the form to fold in at the middle when the braces were removed. At the Kathleen mine, the forms were made of 2 x 8 shiplap fastened vertically to horizontal studdings held in place by a frame work of 3 x 3-in. angle irons bolted at the corners and braced by easily removable 4 x 4-in. buntons. Five or six sets of forms were kept in use, the lower sets being removed and used at the top after each pouring.

The air shaft of the Standard No. 2 is probably the largest shaft in cross-sectional area in the coal fields of the United States being 19 x 36 ft. outside dimensions at the surface and 14 x 31 ft. inside. It is also timbered in the same way as the main shaft and is lined in the same manner. This shaft has four compartments: air, stairway, main cage and counterweight.

The use of a counterweight cage in the airshaft has been adopted at two of the Illinois mines considered—Standard and Valier. In each case the main cage is large, that of the Standard being of sufficient size to accommodate a 15-ton locomotive without disassembling, and the one at Valier being of approximately the same size. In each of these cases the counterweight cage is small and has two decks; the number of men hoisted on the two cages will be the same. At the Valier mine 30 men will be hoisted per trip, while the main cage at Standard No. 2 will accommodate 45 men, allowing over 2 sq.ft. of area per man, though the number hoisted per trip will probably be less. In each case counterweight cars will be used on the small cage when heavy loads are handled on the main cage.

At the Superior No. 4, the main shaft is 313 ft. deep and is 11 x 21 ft. inside. The lining is of reinforced concrete 2½ ft. thick for 100 ft. and from 15 to 18 in. thick for the remainder of the distance. The buntons are 8-in. I-beams riveted to 30-ft. lengths of channel iron. These were fabricated on the surface and lowered into slots left in the lining to receive them, later being wedged into alinement and anchored with concrete. At this mine 65-lb. railroad rails are used for guides. The air shaft is 11 x 17 ft. inside with the same lining as the main shaft. This shaft has only two compartments, airway and stairway, separated by a solid 12-in. reinforced-concrete partition. No hoisting is done at the air shaft.

Stairway at Superior No. 4

The stairway at this shaft is different from any other in the state. The landings, of concrete reinforced with triangular wire mesh, were cast in place as the lining was cast. The stringers and treads, also of reinforced concrete, were cast on the surface and lowered into position; the stringers were put into place and the treads slipped into notches left for them. Both shafts were concreted in sections as the sinking progressed. At the bottom of the air shaft is a deflector of concrete so curved as to direct the air in both directions along the airway with the least eddying.

At the Kathleen mine, the main shaft is 261 ft. deep to the bottom of the coal and is 11 x 19 ft. 11 in. inside. The lining is of concrete approximately 1 ft. thick. The buntons are of 6-in., 23.8-lbs. H-beams set on 5-ft. centers. Guides are 85-lb. steel rails. The air shaft is 230 ft. deep, 12½ x 26⅓ ft. inside, and the lining like that of the main shaft is 12-in. reinforced concrete. The shaft is divided into four compartments—hoisting compartment 9 x 12½ ft., counterweight compartment 3 x 12½ ft., stairway compartment 4 x 12½ ft., and air compartment 8 x 12½ ft. The air compartment is separated from the remainder of the shaft by a 12-in. reinforced-concrete partition. In this mine only one cage is used, but this has two decks each of which will accommodate 25 men. The counterweight is of concrete with a scrap-iron aggregate. Both shafts were temporarily lined with 3 x 12-in pine curbing. The buntons in the air shaft are 9-in., 21-lb. I-beams. The hoisting capacity of the air shaft is about 800 tons of coal in eight hours.

Hoisting Shaft at Bell & Zoller No. 2

At the Bell & Zoller mine No. 2, the hoisting shaft is 12 by 21 ft. 8 in. inside. The lining is a wooden cribbing of 6 x 12-in. timber laid on the sides for a depth of 60 ft. and on edge for the remainder of the depth. The upper 60 ft. has a lining of 6 in. of reinforced concrete and the remainder has 2 in. of gunite with wire-mesh reinforcement. There are three rows of 6 x 12-in. wooden buntons with 8 x 10-in. yellow-pine guides. The air shaft is 12 ft. 2 in. by 22 ft. 10 in. and is divided into three compartments, a stairway 3 ft. 2 in. by 12 ft. 2 in., an air compartment 10 ft. 7 in. by 12 ft. 2 in. and a cage compartment 8 ft. 1 in. by 12 ft. 2 in. The partition between the air and hoisting compartments will consist of 6 in. of gunite and the buntons will be coated with gunite to make them fireproof in compliance with the Illinois law. The counterweight for the air-shaft cage runs on wire-rope guides in the air compartment.

At the Valier mine, the main shaft is 605 ft. deep to the bottom of the coal with a 52-ft. sump below this. The inside dimensions are 11 by 18 ft. 1 in. The lining down to the rock, a depth of 30 ft. is 24 in. of reinforced concrete and for the remainder of the way is from 12 to 15 in. thick. The reinforcing consists of ¾-in. bars set on 6-in. centers vertically and 1-ft. centers horizontally. The concrete mixture was 1 to 4. The buntons are reinforced concrete cast on the surface and lowered into place and there anchored with concrete. The air shaft is 13 x 30 ft. inside and has a lining similar to that of the main shaft. This shaft has four compartments—airway 9 ft. 9 in. by 13 ft., stairway 4 ft. 3 in. by 13 ft., cageway 8 ft. 4 in. by 13 ft., and counterweight compartment 4 ft. 4 in. by 13 ft. The air compartment is separated from the other compartments by 12 in. of reinforced concrete. The guides are 8 x 10 in. wood. The excavation for the air shaft amounted to 12,000 cubic yards.

The American No. 2 hoisting shaft is 12 x 20 ft. inside dimensions and is 248 ft. in depth. From the surface to the rock, a distance of 52 ft., it is lined with reinforced concrete, the balance of the distance with 4 x 10-in. yellow pine placed on edge. There are three rows of buntons; steel I-beams through the concrete, and below this 6 x 10 in. wood. The guides are 6 x 10-in. yellow pine. The air shaft is 12 x 18 ft. inside dimensions, with two compartments, air and cage. The counterweight for the cage runs in guides in the air compartment and is made up of sections or blocks of cast iron so designed that it may be made heavier or lighter by the addition or removal of these sections. The lining of the air shaft is similar to that of the hoisting shaft.

In the mines developed according to the common practice of the present day in this district, the output is limited, first, by the capacity of the shaft or tipple and, second, by the layout of the underground workings. Both of these features have been given careful atten-

tion in the new developments under consideration.

Two lines have been followed in the increase of the hoisting capacity of the shafts. In three of the mines considered, capacity is being increased by the use of large mine cars and of hoisting appliances adequate to handle these cars, whereby the number of hoists necessary for large output is decreased somewhat by increasing the amount of coal hoisted at each trip. In the case of the other mines the coal is hoisted in skips. As the skips hold about two mine-car loads of coal the hoisting speed can be reduced by about one-half.

Another considerable advantage of hoisting in skips is the fact that tight cars can be used. A large part of the troubles encountered in handling coal in cars arises from the end doors necessary when the car is hoisted in a self-dumping cage. Moreover, such cars are always more or less leaky and a considerable amount of coal is scattered along the haulage roads, where some of it is ground into dust, part of which is suspended in the air and part deposited on the ribs, adding considerably to the chance of explosion.

The principal advantage of hoisting in cars is that the product of each miner is kept separate from that of other workmen until it has reached the surface where it can be inspected for impurities. When coal is dumped from the mine cars into skips at the bottom of the shaft, this last advantage is sacrificed to the advantages of lower hoisting speed and a smaller number of hoists per minute. It is this advantage of hoisting in cars which has determined the retention of this system in the three prominent cases mentioned.

Still Pursue Old Method of Dumping Coal

At three of the mines, the Superior No. 4, the Bell & Zoller No. 2, and the American No. 2, the old method of hoisting coal in end-dump cars on self-dumping cages is followed, while at the other mines the coal is hoisted in skips. The No. 1, or Zeigler, mine of the Bell & Zoller Mining Co., is equipped with skips, but these were installed by the predecessors of the present operating company before this method of hoisting coal had reached its present development. This company has not adopted skips in the new mine.

Apparently there are no new developments as far as the use of cages is concerned, except in connection with the size of cars, which, at all three mines where cages are used, hold approximately 5 tons. No new arrangements were required at the shaft bottoms in connection with the three mines at which cages are employed, though all have been planned to make the rapid movement of cars easy. Where skips are used the main shaft is set at the side of the entry. In all cases the cars are handled in rotary dumps, the coal going into a chute from which it passes either directly into the skip or into a hopper. The former arrangement is used at the Kathleen and Valier mines, see Fig. 2. In each of these cases two cars are to be discharged simultanously and the trip is to be passed through the rotary dump without uncoupling. In each case the chute branches and coal is directed to the proper side by a vane.

At the Valier mine, all operations in connection with dumping and hoisting will be performed by one man at the bottom. The position of the vane in the chute and of the skips will be indicated by lights. The bottom man, observing which skip is at the bottom, will direct the vane into the proper position to discharge coal into the skip. These positions are indicated by the simultaneous lighting of two lamps in the same column. The rotary dump is then operated and the hoist started. The operation of the hoist is to be entirely automatic, only the starting being performed by the bottom man.

At the Standard No. 2, two rotary dumps are set side by side, see Fig. 3. From the cars, the coal goes into a hopper of, approximately, 40 tons capacity and cars can be dumped without regard to the position of the skip. In this case the cars are uncoupled and dumped singly. From this storage hopper the coal will go to a measuring hopper holding one skip load of about 12 tons, then into the skip, as soon as the latter arrives at the shaft bottom. As the empty skip descends, it

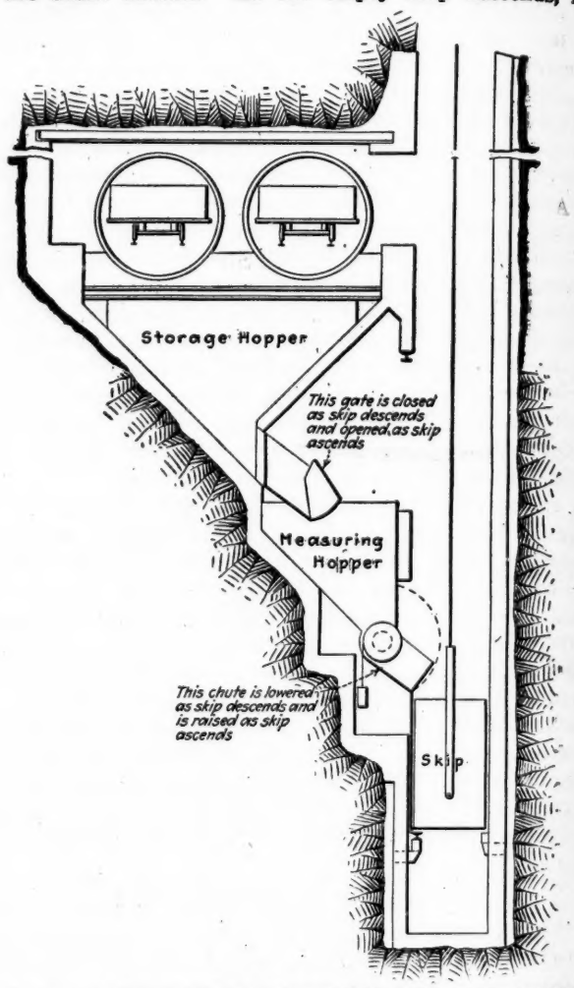

Storage Hopper
This gate is closed as skip descends and opened as skip ascends
Measuring Hopper
This chute is lowered as skip descends and is raised as skip ascends
Skip

FIG. 3. SHAFT BOTTOM DUMPING ARRANGEMENT, STANDARD OIL CO.

will close the discharge gate of the storage hopper and open that of the measuring hopper. As it ascends it will close the gate of the measuring hopper and open that of the storage hopper. The chute from the storage hopper is self-sealing, the gate being used only to prevent coal from passing into the measuring hopper during the loading of the skip. The amount discharged into this hopper can be somewhat varied by raising and lowering a dam in the upper part of the hopper, in this way changing the point at which the accumulation of coal seals the chute. The breakage resulting from this method of loading is not objectionable as all coal from this mine is to be crushed.

At the Kathleen and Valier mines the skips have curved bottoms, while at the Standard No. 2 the bottoms are square.

Various means have been adopted for cleaning the sumps. At the Valier mine an extra compartment is excavated at the side of the shaft to the depth of about 10 ft. below the shaft bottom. An elevator in this compartment will raise the spilled coal and load it into cars.

At the Standard No. 2, it is thought that the method of handling coal from the hoppers will largely prevent spillage into the sump and that little besides dust will accumulate. For the removal of this material a square box it fitted in the sump. When this is full it will be attached to the bottom of the skip and raised high enough to be dumped into one of the hoppers.

At the two Illinois mines at which coal is to be hoisted in cars, steam-hoisting engines will be employed, while an electric hoist will be used at the Indiana mine. These engines have cylinders 28 x 42 in. and an 8-ft. cylindrical drum. The hoisting equipments of these two mines are nearly the same, as are the depths of the shafts and the loads to be raised.

At the other three Illinois mines, electric hoists will be used. The load is about 9 tons at the Kathleen and Valier and about 12 tons at the Standard. The most important difference in conditions is the depth of the mines, the Valier shaft being 605 ft. deep, while the Standard No. 2 is 317 ft., and the Kathleen 261 ft. These depths are from the shaft collar to the bottom of the coal and approximately 100 ft. will be added in each case by the depth of sump and height to dump circle.

The air-shaft hoist at the Standard No. 2 will run at a rope speed of 600 ft. per minute and the main shaft hoist at 900 ft. per minute. The hoisting cycle at the main shaft will be 48 seconds and it is expected that the average amount of coal hoisted will be 20 tons per minute. At this mine, the hoists at both main and air shafts are geared machines operated by alternating-current slip-ring motors with liquid-rheostat control on the secondary. These motors will run on 2200-volt currents. The main-hoist motor is 900 hp. and the air-shaft motor 250 horsepower.

At the Valier mine, the maximum rope speed of the air-shaft hoist will be about 700 ft. per minute, and that of the main hoist about 1600 ft. per minute. The hoisting cycle at the main shaft will be 35 seconds for starting, accelerating, hoisting and stopping, and 8 seconds for loading.

The main hoist at the American No. 2 has a 7- to 10-ft. combined cylindrical and conical drum, directly connected to an 800-hp., 500-volt, direct-current motor that receives its energy from a flywheel motor-generator set operated by a 500-hp., 2200-volt motor, driving a 750-kw., 500-volt direct-current generator. It is expected to make four hoists per minute. In addition to the 800-hp., direct-current motor, the drum is connected at the opposite end through herring-bone gears and a clutch to a 350-hp., 2200-volt alternating-current motor, which will be used at night and on idle days to avoid the necessity of using the flywheel set for intermittent operation. The air-shaft hoist is driven through clutch and gear by a 250-hp., 2200-volt alternating-current motor at one end, and at the other by a double 10 x 12 geared steam engine. Should the electric power fail, it will be possible to operate the air-shaft hoist by steam in order to take the men out of the mine. The fan, which is ordinarily motor driven, is also equipped with an auxiliary steam engine to be used in case of failure in electric power. Steam for these auxiliaries and for heating the surface buildings will be furnished by a 150-hp. boiler.

At the Kathleen mine, the combined cylindrical and conical drum is driven through a Francke flexible coupling by a 600-kw., direct-current motor, with full voltage speed of 235 r.p.m. Current will be supplied to this hoist motor at 500-volt by a flywheel generator-set having a 500-hp. alternating-current induction motor, taking current at 2200-volts and running at 900 r.p.m. The direct-current 500-kw. generator is separately excited. The flywheel weighs 20,000 lb. This set is equipped with a speed-limit switch. The hoist is equipped with air-operated brake, a Royer & Zweibel over-winding device and mechanical slow-down. The air-shaft hoist is operated by a geared slip-ring induction motor operating on 2200-volt, 60-cycle, three-phase current and having Cutler-Hammer reversible magnetic control.

At the Valier mine, the main hoist will be driven by a direct-connected, direct-current motor of 1350 hp. A cylindrical drum is used, 9 ft. in diameter, and the full speed will be 55 r.p.m., giving a rope speed of approximately 1600 ft. per minute. Current will be supplied by a motor-generator set having an 1100-hp. motor and a generator capacity of 1000 kw. with voltage of 0 to 600. This set will run at 720 r.p.m. The flywheel weighs 33,000 lb. The air-shaft hoist will be operated by a geared alternating-current motor.

Legal Department

UNAUTHORIZED USE OF SURFACE—A Pennsylvania deed to coal in place contains the following clause in favor of the grantee: "Together with all the necessary privileges, through and under the lands * * * for the opening, mining, airing, draining, and transporting to market of said coal hereby sold and conveyed, and also any other coal the said party of the second part now owns, or he, his heirs and assigns, may hereafter purchase or acquire; also the privilege of a road or right of way not exceeding 20 ft. in width from the main entrance to said coal hereby sold and conveyed. * * * Said party of the second part restricts himself to one opening on the surface on the south side of said farm for airing and draining." It is held by the Pennsylvania Supreme Court that this clause conferred no right on the grantee to use surface outside the area of underlying coal for the purpose of maintaining a coal chute or other structures. (Horning vs. Kraus, 107 Atlantic Reporter, 695.)

UNSAFE CONDITION NEAR TRACK—Where plaintiff was injured while in the employment of defendant mining company, running along the side of and spragging cars as they were let down grade to a tipple, through stumbling over an abrupt rise from an earth runway to a plank runway, defendant may be held liable in damages on the ground of negligent failure to furnish plaintiff with a reasonably safe place in which to work, if the risk involved therein was not appreciated by plaintiff, although the rise was plainly visible to him. (New Mexico Supreme Court, Leyba vs. Albuquerque & Cerrillos Coal Co., 182 Pacific Reporter, 860.)

TITLE TO COAL IN TRANSIT—The consignee of a shipment of coal, or other commodity, is presumptively the owner thereof, so far as concerns right to hold the carrying railway company liable for negligent delay in transportation. Hence, where defendant was sued for demurrage charges accrued on delays in unloading cars, he was entitled to counterclaim damages arising from delay in delivering coal shipments which had been originally shipped to one from whom he bought them while they were in transit, the railway company having consented to the reconsignment. (Indiana Appellate Court, Cleveland, Cincinnati, Chicago & St. Louis Railway Co. vs. Partlow, 123 Northeastern Reporter, 838.)

Semi-Annual Meeting of the West Virginia Coal Mining Institute held at Huntington

By R. Dawson Hall
Managing Editor, Coal Age

SYNOPSIS—Despite the strike the institute held a well-attended and interesting meeting, good papers being presented. Storage-battery locomotives, mine drainage without, or with less, pumps, standardization of mine machinery, the coal-camp Sunday School and coal recovery were the principal subjects.

THERE was some fear that the West Virginia Coal Mining Institute would find its 24th semi-annual meeting a failure because of the strike, but the dislocation of industry only eliminated one class of men while it supplied another. The mine managers were somewhat generally absent. Their responsibilities kept them strictly at home. They were either busy or apprehensive of trouble. On the other hand, the engineers never had a less responsible time than they have now. Not much mining development is in progress, and as the mines are idle, there is no maintenance work to be done or mine maps to be extended. Probably it was for this reason that the meeting did not suffer grievously from the loss of the chief executives.

There were a number of state mine inspectors present. The institute has steered somewhat clear of late from controversial topics such as disturbed its earlier years, and when it has tounched on them it has been only broadly and in a manner to offend only the supersentitive. As a result the attendance has been more general. In fact a general cussing-out of the mine worker may be a relief, but it can be done better at home among friends than in public. The introduction of what is frequently dubbed "politics" for many years made it difficult for mine inspectors to attend. Fortunately that is no longer the case.

THE MEETING WAS WELL ATTENDED

The meeting was held in the Frederick Hotel, Huntington, W. Va. about 100 persons being present. The address of welcome was ably made by R. L. Hutchinson, president of the Huntington Chamber of Commerce. He pronounced the only sentence against the mine worker occurring in the entire meeting when he said that the producer was hard pressed between the miner on the one side and the Senate on the other. The Senate of late has been somewhat sympathetic. If he had replaced the Senate by the Fuel Administration, the Railroad Administration or the President he would have been more nearly correct.

With a Fuel Administration which expects to put one sixth of the coal capacity of the country out of business and raises wages 14 per cent and leaves prices where they are, with a Railroad Administration that refuses to buy coal in July and commandeers it in November and cannot tell when it will pay for it and with a President who holds that the right to strike is inherent even with an organization so nearly national that it can by its strike cripple the nation's industries, surely it is not necessary to blame the present Senate for our woes, however much we may excoriate its predecessors.

Josiah Keeley was not present, so a vice president took his place. The gavel fell to J. R. Cameron, of Bluefield, W. Va. and he, after a few remarks on the future of the institute, called on H. B. Smith, assistant manager of the Crozer Coal and Coke Co., to read what proved to be a most complete and valuable address on "The Care of Storage-Battery Locomotives". To J. L. Dawson of the Ironton Storage Battery Locomotive Co., was assigned the duty of leading the discussion.

He recommends the modified constant-potential method for recharging storage batteries. He said that battery upkeep was not to be regarded as a depreciation charge. It was strictly a charge of maintenance, though he cited one case where in two years the only expense of operating the locomotives had been for current, lubricating oil and electrolyte.

Asked by Mr. Griffith whether any progress had been made for fitting the storage-battery locomotive for use on main haulages, he replied that nothing had been effected except in the direction of increasing the number of cells and providing means whereby the locomotive could be run at will either from the storage batteries or from a trolley wire. It was stated that one storage battery now entering its 24th month had for 15 months taken cars up a 14 per cent grade, 400 ft. long. One mining man said that he charged his locomotives in series by raising the charge on the more exhausted batteries till it reached the charge on those less exhausted.

SOLENOID USED WITH STORAGE BATTERY LOCOMOTIVES

H. B. Ingham, of Chateroy, W. Va., said that his company has seven storage-battery locomotives working on bad grades. He had provided these with trolley poles. They could not feed the batteries when these trips were on heavy grades, but they could charge them when the locomotives were waiting for car trips. He put in a solenoid that prevented the batteries from feeding into the line when a circuit breaker went out or when other locomotives or even mining machines drew too heavily on the line current.

J. K. Mahaffey of the Edison Storage Battery Co., in reply to a question of one of the members said that the space of ¾ of an inch always provided between the cells of a storage battery could not be filled with insulating material because it had to be left open for purposes of ventilation and cooling, nor could an insulating cover be placed over the cells for the same reason. It is true such a cover would most satisfactorily prevent sand from drifting in and short-circuiting the batteries and preclude the possibility that the motorman would drop a burr or some other conducting material where it would connect the cells, but any provision that interfered with ventilation would make injury to the cells sure while the present conditions make injury dependent solely on the improper care of the equipment. Some companies desiring to protect the cells from injury padlock the cover in place, and thus make it almost impossible for meddlers to injure the cells.

Loman Riggs, division engineer of the Consolidation Coal Co., then read a paper on "Elimination of Mine Pumps". He described many of the means used to make pumping necessary. R. Dawson Hall spoke at some length regarding the many expedients—tile, siphons and drilling to the limestone, among others. He declared that the joints of the tile should always be laid true and tight: If cement joints were not used, at least clay joints should be inserted. If the latter are chosen, enough wood, or pipe chips or other hard material should be used to keep

the pipes in true alignment, and the pipe should be surrounded by material of such a character as will keep the clay in place despite the water pressure.

He said that if a tile drain is laid in rock, with rock filling and the joints are left open the water is apt to pass through the joints and travel through the rock-filling around the pipe leaving the sediment in the pipe, thus clogging it up. Until the ditch in which the tile drain is laid succeeds in choking up with enough sediment to keep the water in the pipe, and until the pipe has been properly cleared of sediment, the passage of water will be slow and unsatisfactory and no water may pass through it at all.

The best way to get rid of sediment is to keep it in the water and that can frequently be done even where attempts are now being made to take it out at various manholes or traps. It is necessary however to see that water, and the material tending to settle, be compelled to travel along together.

COMBINED AIR CARRIED WITH SYPHON

Similarly a siphon must carry its combined air along with it even though, under the reduced pressure at the high point, the air desires to part company with the water. This is the crucial point in a siphon and not the discharge. If there is to be any reduction in diameter of pipe it should be here, for unless the water runs fast at that point it will leave air behind it, and the air will put a back pressure on the water in the ascending leg of the siphon. When a few bubbles of air can be seen rising in the water in the trough at the end of the down leg of a siphon the man in charge may feel confident that what entered the pipe in the mine is leaving it at the surface. Unless the pipe discharges all it receives, it cannot go on working very long.

Mr. Hall also stated that in Pennsylvania it was customary to drill down into the underlying limestone, from the coal or even the surface, using churn drills in the latter case, for the limestone usually has large crevices which make channels by which water may be discharged to the surface. In every limestone country it is noted that the limestone crops are sources of large discharges of calcareous water.

They drain the measures above them as well as themselves whenever a passageway, natural or artificial is provided from the measures above. While limestone is impervious, its solution creates in it wonderful natural channels of which the subterranean waters freely avail themselves.

Discussion vered to wood drains, and it was said that an old oak box covered with 2½ in. oak plank was found with bottom and sides in good condition and so impregnated with sulphate as to be cut with an axe only with difficulty. But the top which had been dry and wet by turns and had not been fully impregnated had rotted away and broken down. The top blank of a drain should be cut into lengths equal to the outside width of the drain and set crosswise instead of lengthwise, of the waterway. It can then be taken up where desired, and the drain cleaned out. Such sections as are injured can then easily be replaced.

In the afternoon session, the disposition to consider the subject of mechanical loaders was so strong that the discussion turned in that direction when a paper was read on "The Large Mine Versus the Small mine as a Standard of Operation" by E. L. Bailey, general superintendent, Solvay Collieries Co. H. B. Ingham declared that, by the use of the mechanical loader, 38 to 40 ft. of progress in headings had been made per shift with coal 7 to 10 ft. thick. The machine loaded 120 to 150 tons per day. The machine of the Lake Shore Engine Works, Marquette, Mich. loads three times as much per man shift as a human loader will put on the cars.

It requires three men to run it and does with that help as much as nine men. These men are a trimmer, a loader and a third man to supervise the work of the machine. In all there are 8 men in the entry, three men being employed on the cutting machine which has a cutter bar 7½ ft. long. A 10 ft. cutter bar was tried at one time but it did not give satisfaction in about two cases out of three because the coal did not all come down, and pot shots and hand picks had to be used to make up for the deficiency of the main shots, and that was a cause of much annoyance and delay.

The maximum tonnage mined in an entry in any one day has been 225 tons. Mr. Ingham added that he had never used the machine in pillaring work. It is working in only a 12 ft. roadway, but the large machine will clean a width of 20 ft. without a shift. He stated that the production was cut down to one half of the capacity of the shovel by the delay in the supply of cars. The machine has loaded as much as 3 tons in 1¼ min., but service of that kind is obviously not attainable in continuous practice. The rate for the short period of time was equal to 1152 tons per 8-hour shift.

In the discussion of the mechanical loader it was brought out that one loader has a 3-ton hopper which serves, at least in a degree, to permit the steady action of the shovel whether a car is in place at the rear end of the conveyor or is not. E. E. Jones, of Stotesbury, described his experience with a scraper loader which he had worked on faces varying from 30 ft. to 200 ft. He had the best results with a 60 ft. face. With seven men he had loaded from 75 to 150 tons per day in 30 in. of coal. The men were paid by the day with an allowance for the tonnage loaded or yardage cleaned up. Four acres had been mined, and the coal loaded by the scraper. There was a sandstone 60 ft. thick which gave a strong roof. Several times the places had fallen in and caused them to lose the face but the equipment was not destroyed in any case.

UNIQUE AMERICANIZATION METHODS

"The Coal-Camp Sunday School" was discussed by J. L. Dickerson, Kanawha Valley Bank, a man with a religious interest in Sunday Schools and a financial interest in coal mines, by J. O. Doolittle, the active superintendent of the Rural Department of State Sunday School Association and by W. A. Snow the general secretary of the same institution. Mr. Doolittle has an automobile with beds folding outward like a pullman car with a kitchenette, organ and typewriter and is making his rounds through the coal fields, organizing the constructive elements of the mining camps for law, order and good citizenship. He finds that the best results are obtained where he does not have to accept the hospitality of the people in the camp. They are less likely in that case to regard his mission as a mercenary one. His home on wheels enables him to go through the coal fields without being anyone's guest.

After the address an automobile ride through the beautiful city and suburbs of Huntington fully convinced the visitors that the Cabell County town was one of the best cities in the world to live in. It claims to have passed Wheeling and vaunts itself on being the metropolis of the state.

On Tuesday Dec. 2, in the absence of R. L. Kingsland, chief of the Power and Mechanical Department of the Consolidation Coal Co., E. D. Knight of the same department of the Cabin Creek Consolidated Coal Co. led the discussion. He said that he had been so impressed with the importance of standardization that he had arranged, in four locomotives of different makes, to have standard gears though he had to use some that were not listed in the catalogues. The change altered the gear ratios, it is true, but not in a way

that prevented the proper functioning of the locomotives. Thus one gear ratio should have been 69:14 and when he had changed it, it became 68:15. In some cases he somewhat increased the speed and accordingly lessened the draw bar pull, but that did not make any material difference to the operation or life of the locomotive.

J. R. Cameron said that he would be sorry to see 42-in. accepted as the sole standard for mine track gage as conditions were so varied. He wanted at least 36,42 and 48-in gages to be permitted.

Mr. Knight said that the American Mining Congress' standardization committee had recommended a 24 in. gage for metal mines and 36 and 48 in. for coal mines, 42 in. to be added if possible, to these three. Another speaker declared that the proposal was not final but only tentative. In his belief four gages were necessary but possibly four gages were also enough. No one wanted to introduce a universal mine gage, but every one desired to see an ending of the present chaotic condition in which the gages varied from one another by only ½ in. differentials. A 44-in. gage, he thought would have to be adopted because so many had their equipment built to accomodate it.

DISCUSSION ON COAL RECOVERY

Mechanical loaders could not be further discussed as James Elwood Jones, general manager of the Pocahontas Consolidated Collieries Co., who was to read a paper and E. Drennan, general manager of the West Virginia Coal and Coke Co., who was to discuss it were both absent, like most of the other general managers who usually put in an appearance at these meetings. "Recovery of Coal" was discussed by A. C. Callen, professor of mining of the West Virginia University.

He declared that subsidence and breakage were not synonymous terms—that the roof would sometimes bend and flow without breakage, and thus relieve the strains which excavation created in it. He referred to the interesting case of the Marquette Cement Co. versus the Oglesby Coal Co., near La. Salle, Ill. The first company had a limestone mine which from the evidence in court stood up well on its pillars until the Oglesby Coal Co's longwall workings began to approach the limestone mine from beneath.

L. E. Young, the University of Illinois authority on subsidence, set several bench marks and noted periodically the changes in level. As a result it was found that over the limestone mine before the longwall reached it the surface of the ground actually was raised by the stresses incident to subsidence over the extracted area.

W. J. Heatherman, chief inspector of the state of West Virginia, in his discussion urged that the upper unmined seams of West Virginia should be protected from the harm done by the excavation of lower seams of greater thickness. He felt that the upper seams, when of inferior value would never be mined first till legislation was passed compelling their earlier extraction.

One of the inspectors, Evan L. Griffith read a paper on extraction and he was followed by J. G. Vaughan, another inspector. Mr. Thomas declared that he had noted when two seams had been worked with 220 ft. of an interval between them and in the upper bed the recovery was between 85 and 90 per cent. Frank Haas, consulting engineer of the Consolidation Coal Co., was disposed to question whether it was the best plan to attack the upper seam first and leave the lower seam intact till the lower was worked out.

In the Meyersdale section, the Redstone was some 60 ft. above the Pittsburgh bed. The Redstone seam was 6 ft. thick and was mined first. When the time came to extract the Pittsburgh bed which was 9 ft. thick, it was found to have what might be termed a "floating top". It proved quite hard to handle and much coal was lost in the Pittsburgh seam, which was unfortunate as it was the thicker of the two as has been noted above. What was lost in the lower seam, would have made a seam as good as the Redstone.

In the Georges creek field, the "Big bed", or Pittsburgh, has been removed. The Sewickley Tyson, remains above it. It has been mined in many places and with little difficulty. Apparently the more complete the extraction in the Pittsburgh bed, the better the conditions of the Sewickley for recovery, though it was true there were spots in the Tyson where there was no possibility of recovery. He believed that, where there are 100 ft. of interval between upper and lower seams, the lower seam can well be mined first.

LONGWALL SYSTEM ADVOCATED

Mr. Haas said he did not believe that longwall had received a fair chance in the hands of the mining men of this country. He felt that it did offer distinct advantages and should not be condemned offhand, for it was his opinion that it took 10 years to properly test out any mining system. The Consolidation Coal Co., he said, spent hundreds of thousands of dollars trying out longwall and regarded its efforts as failures, nevertheless he believed the plan had merits and should find its way into West Virginia.

It must also be remembered that conditions in this country were different from those in Europe where glacial till covered the surface with loose gravels that rendered subsidence less abrupt and less surface-disturbing. It is not well to quote European experience as determinative of what would occur here.

In the Fairmont region the surface has broken most unmistakably over mine workings that are 700 ft. below. While shelly shale and shelly sandstone will break vertically; hard shale and hard sandstone will fracture at 45 deg., and the fracture may even follow an approximately level line. Several others discussed the subject instancing places where coal had been mined and good recoveries made when the lower of two coal seams was mined first.

The meeting decided that in future the dues should be $5 a year. The following were elected officers for the coming year: J. R. Cameron, president; R. E. Sherwood 1001 Kanawaha Bank Bldg., Charleston, W. Va., secretary-treasurer; R. F. Carson, J. W. Bischoff, W J. Heatherman, E. D. Knight and E. E. Jones, vice presidents; F. Haas, E. B. Day, K. F. Schoew and W. Paul, executive board members. With the close of the election the meeting adjourned.

The impurities permitted in coal shipped under the old "65 per cent. contract" are not to exceed the percentages given in the following statement:

	Per Cent. Slate, Rock, Etc.	Per Cent. Bone
Broken	1	2
Egg	2	2
Stove	4	3
Chestnut	5 to 7*	5
Pea	10	†
Buckwheat	15	†
Rice	20	...

* Average shall not exceed 5 per cent. and maximum shall never exceed 7 per cent.

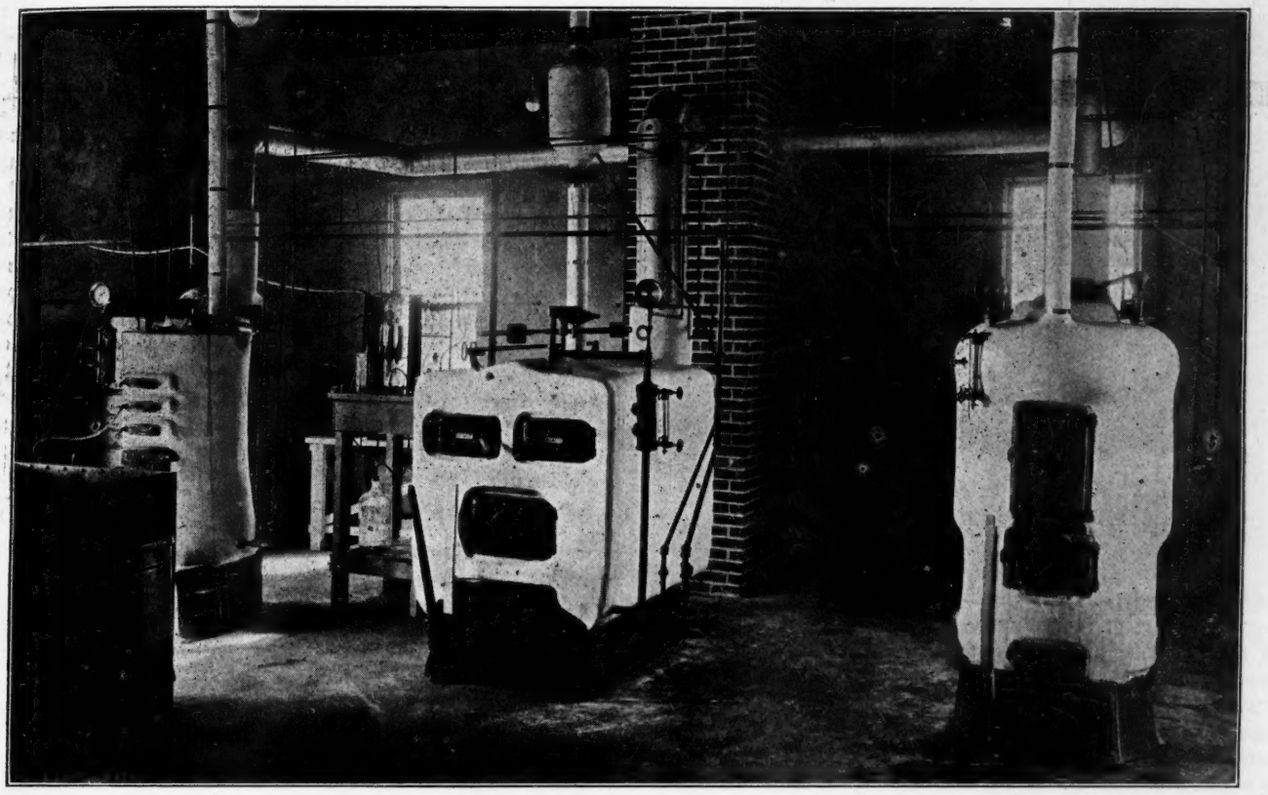
† Bone content shall not reduce price below average for these sizes.

The need of preparing for explosions is most evident to one who arrives at the scene of a disaster and finds a total absence of material, tools and equipment for quick recovery of the men entombed or for quick entry into the mine. Lack of such preparation no doubt has often resulted in unnecessary loss of life among the imprisoned miners, and also among the rescue force.—*Rescue and Recovery Operations in Mines.*

Future Developments in the Use of Fuel*

By H. KREISINGER†
Pittsburgh, Penn.

IN the near future increasing quantities of low ash coal will be shipped to population centers to be used in by-product plants for making coke, gas, oil, and other useful products. Low ash coal is preferable for this purpose because it is desirable that the coke have a low percentage of ash. The large size of coke will be used for metallurgical purposes, the medium and the small sizes for heating purposes, and in small power plants located in the heart of the city where smoke is prohibited. The very small sizes and coke breeze will be burned on stokers in larger power plants.



VIEW OF THE INTERIOR OF MINNEAPOLIS, MINN., FUEL TESTING LABORATORY

The surplus gas from the by-product plant will be used in steadily increasing quantities for cooking, house heating and lighting. It will also continue to be used in certain industrial furnaces where it is desirable to have clean products of combustion.

The light oil recovered from coking soft coal will supply part of the ever-increasing demand for motor fuel. Already large quantities of this oil are used for that purpose. The heavier oil or coal tar will be used in the manufacture of a large number of drugs, dyes, explosives, paints, wood preservatives, road dressings, roofing and building papers and a great variety of other useful articles. The number of new articles made from coal tar will increase daily. Coal tar will also continue to be used in place of fuel oil for metallurgical purposes.

Another valuable product is ammonia. Its chief value lies in its nitrogen content. One of the most important uses of ammonia is in making artificial fertilizer. More fertilizer means more productive farms, which are especially desirable in the thickly populated industrial centers, where large quantities of food are needed. If the food is produced where it is used, transportation charges are eliminated, and thus the cost of food is materially reduced. Ammonia is also used in artificial ice making, cleaning, and in the manufacture of nitric acid. It has frequently been proposed to build large hydraulic power plants to generate cheap electricity and use the electricity to obtain nitrogen from the air. It seems, however, more logical to get the nitrogen direct from the coal by coking it in by-product recovery plants, instead of burning the coal in the raw state, discharging all its contained nitrogen into the atmosphere and then building expensive hydraulic plants to get back from the atmosphere part of the nitrogen wasted in burning the raw coal.

When one ton of soft coal having a market price of $7.00 per ton is coked in a by-product plant, the chief products obtained have the value shown in the following table:

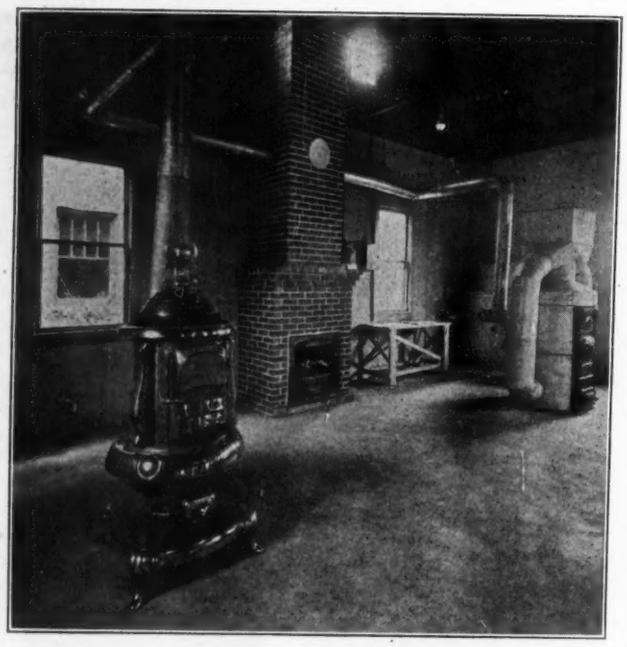
0.65 ton of coke, worth	$ 6.00
5,000 cubic feet of gas, worth	5.00
3 gallons motor oil, worth	.75
9 gallons of tar, worth	.25
25 pounds of ammonia, worth	1.25
Total value of products	$13.25
Less cost of 1 ton of coal	$ 7.00
Increase of value	$ 6.25

The table shows that the products of the coking process have a market value about 90 per cent. greater than the original coal. This increased value is due mainly to the human labor expended in the coking process, because it takes

*Paper presented before the Coal Mining Institute of America, Pittsburgh, Penn., Dec. 3 and 4, 1919.

†Fuel Engineer, U. S. Bureau of Mines.

a great variety of labor to plan, build, and operate a by-product plant. The use of bituminous coal in by-product plants will develop in much the same way as the meat packing industry has developed. About thirty years ago a large amount of material from the slaughtered cattle was thrown away, and thus not only was wasted but became a nuisance by polluting streams and the atmosphere. At present everything from the slaughtered cattle is utilized, and the packing industries give employment to thousands of skilled and unskilled workmen and the meat packing centers are no longer a horror to the inhabitants of the surrounding country. In the past soft coal has been burned in its raw state in dwelling



INTERIOR OF MINNEAPOLIS STATION

houses and in many plants not equipped with furnaces that would give complete combustion.

A large part of the valuable substances in the coal escaped as black smoke and was not only wasted but polluted the atmosphere. In spite of the many efforts that were exerted to improve the furnaces in such small plants in order to obtain smokeless combustion, the smoke persisted. Man is now beginning to realize that the smoke from the chimney is a warning to him that he is not using the coal to the best advantage. Times will change; a large part of the soft coal output of the country will be sent through the by-product plant and substances that were previously wasted as smoke will be turned into valuable products, and at the same time smokeless fuels, coke, and gas made available for efficient burning in almost any kind of furnace.

Use of Bituminous Coal in Large Power Plants

Most of the coals higher in ash will be used in large power plants, which will be equipped with mechanical stokers for burning the coal sufficiently. The stokers will be of such design that they will automatically remove the ashes from the furnace. These plants will also have mechanical equipment for handling the coal from the railroad car or boat, as the case may be, to the furnace.

Mechanical equipment will also be used to remove the refuse from the ashpits. The tendency will be to locate these large plants near the coal mine so as to reduce the freight on the coal to a minimum. The power generated in these plants will be transmitted in the form of electrical energy over power lines to places where the power will be used. Whether a plant will be located near a coal mine and the energy transmitted by wires, or the plant located where the power is needed and coal freighted to it from the mine over rail or by water, will depend on the local conditions. In all cases a careful study of the cost of power must be made before it can be decided where the plant should be located.

The increased overhead charges due to transmission lines must be justified by the saving on the freight of the coal and possibly the lower price of the coal due to its higher ash content. Under present-day conditions the margin in which the engineer has to work is not very large. This margin is illustrated in the following diagram, showing in a general way the distribution of operating revenue received by a large central station:

Fixed Charges	50 per cent Interest on Investment (Dividends) Sinking Fund Taxes Insurance
General Expenses	20 per cent Salaries of general officers Advertising Rentals, etc.
Operating Expenses	30 per cent Coal 50 per cent Oils Maintenance Salaries of Engineers Firemen, Labor, Etc.

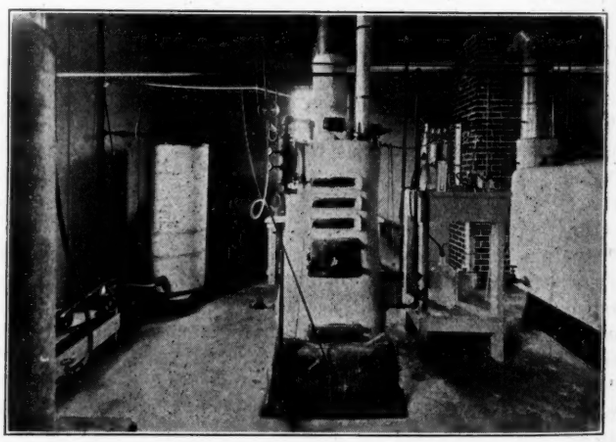
The items in this diagram are given in round figures and are intended to illustrate the principles which guide the engineer in his decision to determine the location of a plant.

The diagram shows that half the revenue goes to pay the fixed charges consisting of interest on investment, sinking fund, taxes, insurance, etc. Twenty per cent. of the revenue goes for general expenses, consisting of salaries of the general offices, advertising, rentals, etc.; and only 30 per cent. of the revenue is spent for operating expenses. Of these operating expenses only about one-fifth is spent for coal; that is, only 6 per cent. of the total operating revenue received by the central station goes to pay for the coal. This figure can be verified in another way. A modern central station uses approximately 1½ pounds of coal per kilowatt hour.

Assuming the price of coal at the station to be $5.00 per ton, the cost of coal per k. w. hour is then

$$\frac{500}{2000} \times 1\tfrac{1}{2} = 0.375 \text{ cents per k. w. hour.}$$

If the average selling price is 6¼ cents per k. w. hour, the coal at the price quoted then constitutes six per cent. of the revenue received by the company. Transmitting power over a long-distance line would increase the fixed charges. In any



FUEL TESTING LABORATORY AT MINNEAPOLIS

good business proposition the increase in the fixed charges must be justified by a reduction in the cost of fuel. However, in the average large power station the cost of fuel is only about six per cent., it is apparent that the increase in the fixed charges due to the installation of transmission lines

must come within the six per cent. cost of fuel. By locating the power plant near the mine the saving in the cost of fuel will largely consist of saving the freight, which, in the average case, constitutes about two-thirds of the fuel bill. It is therefore sound to count on saving only 4 per cent. from the operating expenses and adding it to the fixed charges.

The hydraulic plant is an extreme case of high fixed charge cost and low operating cost. In that case the cost of fuel is zero, but the fixed charge is so large that only a few hydraulic plants can compete successfully with a steam plant. In order to obtain the power at a low cost, industries wishing to use large quantities of it, instead of transmitting it any great distance from the hydraulic plant, establish themselves near the plant in order to save the cost of transmission. It is probable that similar conditions will develop with the steam plants.

In order to reduce the cost of fuel, the steam plant will move close to the mine, or some other supply of fuel; again, to reduce the fixed charges due to long transmission lines, the industry will move to the plant. It is the high fixed charges that make it difficult for hydraulic plants to compete with steam plants, and it is a well-known fact that the average dividends paid by the hydraulic plant are considerably smaller than those paid by the steam plant.

Powdered Coal and Mechanical Stokers

The near future will see a lively competition between powdered coal and mechanical stokers. Both methods of burning coal have many advocates. It seems, however, that the stoker has a better start over powdered coal. It is doubtful if either of the two methods will completely replace the other. The mechanical stoker has its field as well as the powdered coal. It seems that the mechanical stoker will perhaps retain its advantages in the power plant, whereas the powdered coal will have its advantages in other industrial fields, such as burning cement, in metallurgical furnaces, ore roasting, and in other furnaces where the presence of slag in the products of combustion will not have a bad effect on the substance to be heated.

In certain localities it may be advantageous to burn powdered coal under steam boilers. There may also be certain kinds of coal which are better adapted to burning in powdered form than in mechanical stokers. It is difficult to give a general rule that will determine the conditions under which powdered coal will give better results than a stoker-fired furnace.

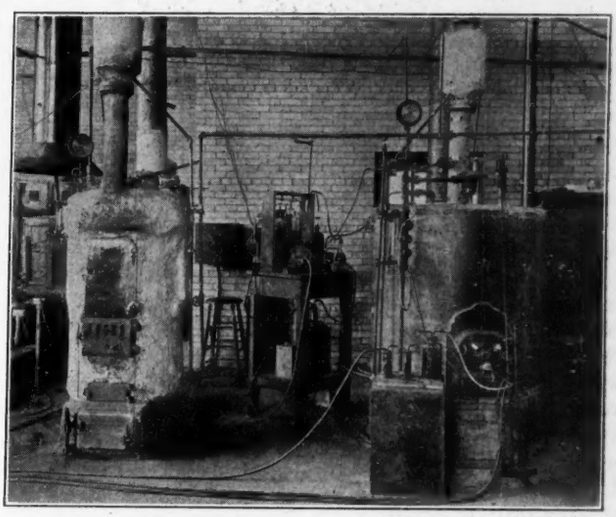
Quite likely each method of burning coal will keep on developing, side by side. When the electrical telegraph was invented it was thought that the telegraph would supplant the mail in carrying messages, but no such thing happened. Both the telegraph and the postal system kept on developing, each taking care of a certain class of business. Again when the long-distance telephone was invented, it was thought that the telephone would supplant the telegraph, but it did not. As the business for the long-distance telephone increased the business for the telegraph increased at the same time. In a similar manner the application of stokers and powdered coal to different classes of furnaces will keep on developing side by side.

Colloidal Fuel

Within the last year and a half the attention of the fuel engineers has been called to a new kind of fuel called colloidal fuel. This fuel consists of a mixture of powdered coal and fuel oil. The making of this colloidal fuel consists of a certain process which keeps the powdered coal in suspension in the oil so that the coal does not settle to the bottom of a tank supplying the furnace with fuel. Numerous demonstration tests were made, which showed that there is a possibility of using such fuel successfully. However, the writer does not know of any test on a large practical scale showing that success with this fuel has been already attained and it is therefore difficult to foretell what may possibly happen in the future along this line. The main advantage of the colloidal fuel seems to lie in the fact that the process would increase the effective supply of the available fuel oil by 40 to 50 per cent. Colloidal fuel appears to have the same advantage in burning as the fuel oil alone.

Electrification of Railroads

The electrification of railroads is hardly a subject for discussion by a fuel engineer. Many investigations have been made along this line by competent men. On the whole, the conclusion reached by these investigations seems to favor the steam railways as far as economy is concerned. It seems that if any electrification takes place within the near future it will not be so much from the standpoint of economy but more from the standpoint of cleanliness and convenience, as well as comfort of the passengers. More of the electrification that we are likely to see within the next few years will be around the terminals of large cities. It will be done largely with the object of eliminating smoke and cinders from the atmosphere. If there was any considerable saving in the electrification of railroads, surely the railroads are the most competent to see it, and they would make the necessary changes to increase their dividends. So far, however, the



FUEL LABORATORY AT U. S. BUREAU OF MINES

railroads always look with disfavor on any pressure by the public to bring about electrification. In some of the large cities the railroads meet the objections of the public to smoke from locomotives by burning coke in switch engines.

Another very promising solution of the smoke problem is the application to locomotives of properly designed mechanical stokers. The powdered coal also offers the possibility of solving the locomotive smoke problem, although the fact that in burning powdered coal a large part of the ash is discharged with the products of combusion, may meet with serious objections. There are, however, certain locations where electrification will show economy. These are the parts of the country where good locomotive fuel is scarce and hydraulic power available close at hand.

Carbo Coal or Coke as Fuel

Carbo coal is prepared from bituminous coal by driving out the volatile matter at a lower temperature than is done either in the gas retort or in the by-product plant. The yield of the carbo coal is somewhat higher than the yield of coke made from the same coal. Because of this fact the percentage of ash in the carbo coal is lower than it is in the coke. The carbo coal burns without smoke and ignites somewhat more readily than coke. It is therefore an excellent fuel for heating houses, cooking, for smaller plants, and in furnaces where clean, sootless fire is demanded. In making carbo coal, light oils and gas are obtained as by-products, although generally not in such large quantities as in the by-product coke oven.

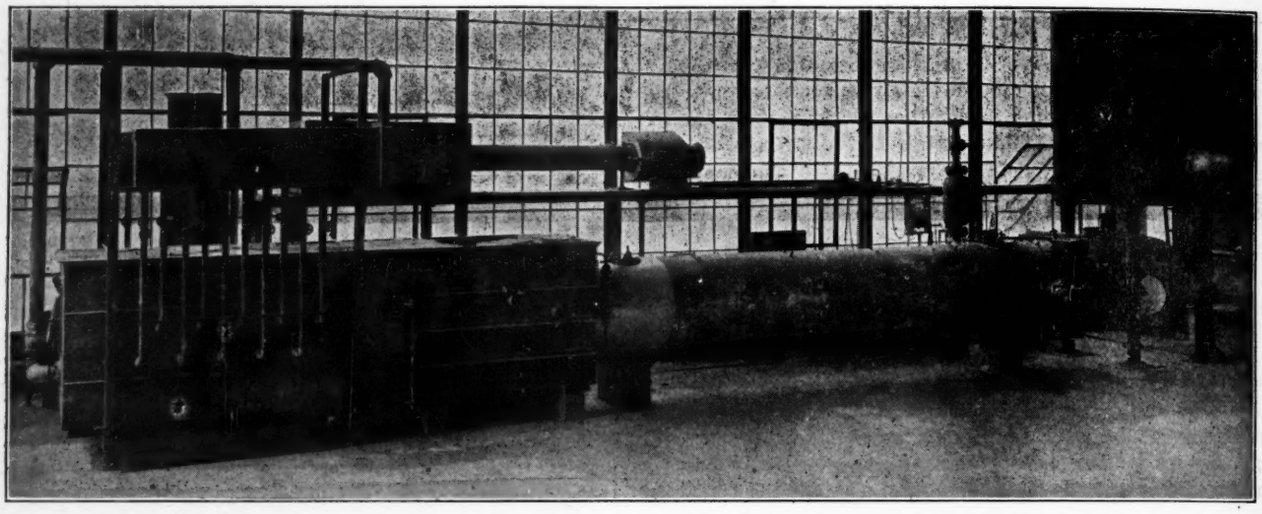
The preparation of carbo coal will therefore develop in localities where there is a large demand for solid smokeless fuel and only a small demand for gas and oil. It is likely that the manufacture of carbo coal will develop along with the by-product plant, each being chosen on account of the existing local economic conditions.

Better Combustion

The ideal of good combustion is to burn all the combustible ingredients in the fuel with no excess of air in a furnace of practical dimensions. All devices for burning any kind of fuel strive to come as near to this ideal as possible. Excess of air used in combustion wastes heat because the extra air has to be heated to the temperature of the gases discharged from the apparatus in which the fuel is used. Incomplete combustion wastes heat because part of the combustible ingredients in the fuel escape from the apparatus unburned. Usually, when the excess of air is reduced incomplete combustion comes into play, and if the reduction of the excess of air is carried to extremes, that which is saved by reducing the excess air is lost by incomplete combustion.

The more perfect the fuel-burning device the smaller can be the excess of air without causing incomplete combustion. Thus, in hand-fired furnaces it is difficult to obtain nearly complete combustion with less than 50 to 60 per cent. excess of air. A well-designed stoker will operate with 20 per cent. excess of air and still obtain nearly complete combustion. With a well-designed oil burner and furnace, the excess can be reduced to 15 or even 10 per cent. and at the same time lose very little by incomplete combustion. Powdered coal has been burned nearly completely with the excess of air reduced to 10 per cent.

Low excess of air and complete combustion are accomplished by high furnace temperatures which is hard on the furnace lining. Therefore, with the strife for complete combustion with low excess of air will go the demand for high grade fire brick that will stand the high temperatures and the slagging action of the coal ash. In a boiler furnace the effect of the high temperatures will be combatted by exposing much of the boiler's heating surface to radiation from the fire and thus keeping the furnace temperature low. This is a departure from the practice of several years ago, when every effort was made to obtain high furnace temperature, which was believed necessary for complete combustion.



COMBUSTION CHAMBER OF HEAT, TRANSMISSION APPARATUS AT PITTSBURGH STATION

Efficient Low Cost Coal-Barge Loading

A spur of the Monongahela River R. R. runs back from the river as far as the Lambert Mine of the H. C. Frick Coke Co. Another spur extends to Edenborn, Lecrone, and other mines of the same company. These are all railroad mines, and load their coal into railroad cars, which are hauled out to the river at Adah Siding, where they are dumped into river barges, and towed to Clairton, Penn.

The company saves about $9 a car by making the change from the railroad to the river haul, for a portion of the distance to Clairton. The Monongahela railroad delivers the loads at the siding, and takes the empties away from it. The Frick company handles the cars at the siding, using its own locomotive.

One side track is built out over the river. It is loop shaped, both ends of the track being connected to the river bank. The foundations are cofferdams filled with rock and cement. Sawed timber uprights support a steel-beam frame work, which serves as the floor of the siding, and the support for the track. The timber uprights are set in two parallel rows, one being on the edge of the river bank, and the other out in the river. The distance between the two rows is sufficient to allow the widest barges to float between them easily.

The steel-beam frame resting on these uprights is high enough above the barges to allow plenty of head room. The railroad track is high on the river bank at this point, and a slight incline to the siding gives it plenty of elevation. Two hoppers, with chutes, are placed between the rails so that two cars may be dumped at one time. The locomotive hauls the cars out over the barges on the river, the bottom of the cars are opened, and the coal allowed to flow through the hoppers and chutes into the barges.

A steam dinkey engine is placed on the siding over the river for moving the barges about under the track. This engine carries cables on two drums. These cables are carried over suitable sheaves to each end of the dumping siding, and down under it to the barges, a cable being fastened to the end of each barge.

The barges are loaded in three layers, or installments. A layer of coal is dumped into it as it is moved down stream, another as the dinkey engine with its cables pulls it back up stream, and a third layer as it is again drawn down stream, and out from under the loading chutes to make room for another barge.

The Labor Problem in the Coal Mining Industry*

BY CHARLES L. FAY
Cumberland, M. D.

THE labor problem in coal mining is receiving more constructive thought now than at any time heretofore. Many plans are or have been offered to solve the labor problem. The problem, however, is too deep seated to respond to a "cure-all" method of treatment, and the time has come when both employer and employee must study economics. Leaders seeking to weather the industrial storms, some through fear, others through interest, are laying aside prejudices, preconceived ideas and foolish notions, and are giving the best they have in them to meet fairly and successfully the problem now facing them. What is true of the labor problem in coal mining is true of the labor problem in all industries. In fact, it does not stop there. We of the mining industry are not in a class by ourselves.

Confining ourselves to the matter of employer and employee in the mining industry, however, what are the needs of the employer? We would answer that by asking what does the employer want? And to that query of what the employees need, we would answer by asking the question what do the employees want?

PRIMARY CONSIDERATIONS ARE INVOLVED

We will say that these questions are answered as follows: The employer wants: Peaceful industrial relations insuring the minimum of labor turnover; maximum of quality production; maximum of efficiency from plant operation without undue strain upon labor.

The employee wants: Assurance of regular work and income; the fear of dependency removed; management methods which guarantee representation, fair dealing and square treatment, and which provides means for self-development and expression for himself and family; opportunity to secur the maximum financial return for his labor.

The progressive employer of today endeavors to secure what he wants by answering the questions of the employees, and this answer, broadly speaking, may be made by installing policies of scientific management and by the development of industrial good will. The management will use every means available to provide regular work, and when business is dull the work will be distributed so that as nearly as possible all the men get their fair share.

The fear of dependency will be removed by installing in addition to state compensation insurance what is known as group life insurance, which tides the dependents of deceased employees over a period of time that enables them to readjust themselves so as to be able to make their own way.

HEALTH INSURANCE SUGGESTED

Health insurance through relief funds or otherwise can be operated so as to provide means of support to employees when sick, but so organized as not to put a premium on absenteeism.

Profit sharing appears to possess constructive values, one of which might be that of further contributing to means for the employee to provide against dependency in his old age.

The bringing about of this "security" sense in the consciousness of the employee results in "good will." In other words, the employer is selling good will to the employee, which means for the employee less labor turnover.

In answering the desire of the employee for security in regular work and income and the removal of fears of dependency, the employee answers the employer's desire for a minimum labor turnover by "staying put."

In the matter of management methods which guarantee to the employee representation, fair dealings and square treatment and which provides means for self-development and expression for himself and his family, the management faces an intricate problem.

The chief executives must take the initiative in installing representation plans, industrial relationship methods, and improvement mediums. The problem is intricate and its bonds complex. After a plan has been decided on, it becomes a matter of educational promotion. First of all, the official organization of the company must be educated, and the first objection met with is the fear of various subordinate officials that "these new ideas of the big boss" will take away their authority, and what's the use of being a boss if you lose your "authority"?

DEMOCRATIC METHODS ENCOURAGED

The next objection you run up against is that "I'm worked hard enough now and this highbrow plan will keep me going day and night." Yes, it would seem that scientific management and industrial good will require more effort on the part of company officials. They do, as they cause them actually to do that which they should have done before. It is the difference between autocratic control and democratic direction. The autocratic method commands, the democratic method confers. Instead of autocratic commands, matters are discussed at conferences with employees, investigations are made, and the results are followed up and reported to those having general supervisory responsibility for the successful operations of the plans. Often it will be found that the subordinate officials are not honestly carrying out the spirit of the plan, but the education of officials and bosses is finally on the way to completion, and in spite of their previous objections they now see wherein these plans are good for them. They learn that there is a bigger field for their efforts than in autocratic and unintelligent domination—a new opportunity open before them. They find that they are more necessary, more important than before, and that they are rendering a valuable social service that transcends petty authority. They realize that they are the keystone of the arch of industrial good will.

No less arduous is the establishment and conduct of an educational propaganda among the employees. It requires a definite policy adapted to their needs. It requires patience—patience on the part of all officials and bosses, as they are now to be teachers. Not only patience is required, but reasonableness and good horse sense.

A few leaders among the employees become awakened to the new plan and its opportunities, and then they become teachers of the new methods and salesmen of industrial good will.

SUSPICIONS ARE AROUSED

At first employees are suspicious, and believe the company "has a knife up its sleeve." And why not? After many years under autocratic domination, of political subterfuges and the general "bunk" that has in too many cases been handed to them, why should they not think these new plans but "another scheme of the company" to "do" them? And so it takes time along lines and by methods that have been proved by practice to be successful, to educate them to know all the ins and outs, the reason for and the benefits of the plan itself.

And right here we may say subterfuges will not succeed. Tricks won't work, schemes fall down, "bunk" is useless. Unless as an employer you are ready to go into scientific management and industrial good will, honestly straight from the

*Paper presented before the Coal Mining Institute of America. Pittsburgh, Penn., Dec. 3 and 4, 1919.

shoulder, all open and aboveboard, leave it alone, for using it as a cloak to "pull something over" on your employees will only widen the present wide gap.

The modern methods of management are not just "glad-hand" methods; they go deeper. They go to the roots of industrial unrest and uncertainty.

Speaking of the "glad-hand" idea, an employer noticed that the stables boss had marked the name of each mule over the peg on which its harness hung, so that each mule should always have the right harness. This gave the employer an idea. He had brass name-plates struck off and had them placed on the machines in the shop. Each plate bearing the name of the man who operated the machine. Then he would go through the shop and speak to each man by name. Knowing the names of your men is good, but "bunk" won't go. One day a visitor asked one of the men what the name-plate on his machine signified. The workman replied: "Well, you know the boss saw how Bill tabs the harness pegs of the mules, and I guess he rates us about the same as mules."

"Hello, Bill!" glad-hand stuff won't go unless the heart is back of the hand. Men *think*, and they don't want patronage, and can readily detect the counterfeit of good will and genuine interest.

Employees do not want paternalism; they want democracy. But in that democracy employees do not desire to be separated from the employers. They want a democracy that is broad enough to comprehend employer and employee co-operating together for their mutual good, a true, democratic partnership.

POLICY OF SEGREGATION IS FALSE

In times past many well-meaning employers have believed that the employees wanted to segregate themselves from the employer, and such employers have urged that point in dealing with employees, and, in fact, employees were sometimes led by policies which destroyed the chance of the same true partnership arising, but all the while there was in the consciousness of the average employee an inherent desire for that partnership. Because of his training and the mistaken attitude of the emloyer, however, he set aside his innermost desire as being outside the realm of realization.

One of the big jobs of the employer today is to get down to fundamentals and not be controlled completely by the apparent, and consequently he must have a true concept of the subjective as well as the objective state of mind of the employee.

So, when installing conference, council and committee organization machinery to handle representation, industrial relationship, living and working conditions, mediums for recreation, means for betterment of health, general safety, individual improvement or development and opportunities for self-expression, it must be predicated upon the basic principle of human rights and formulated so that employer and employee have the means of meeting upon a common platform, while the various committees and mediums are so constituted as to breathe forth the reality of individual democracy.

As Mr. R. B. Wolf, formerly manager of the Spanish River Pulp and Paper Mill, Limited, says: "We are confronted with the problems of correcting the repressive or selfish character of civilization so that it will serve the mass of humanity," and again: "We must learn to change the industrial environment from one that repels to one which attracts. In other words, the incentive to work must be inherent in the nature of the work itself." It is, then, the putting of a soul into business —into industry, into a corporation. In other words, during the great mechanical and engineering strides of big business, the human element was looked upon as negligible and the result was normal or spiritual bankruptcy, hence the problems we now face. The job now is to readjust so that the human element has its rightful place in industry.

The employee wants opportunity to secure the maximum financial return for his labor. He wants the maximum rightful wage, but he wants democracy with it. Profit-sharing will more and more receive the careful attention of progressive employers. But while considering these things, we must more and more look into the working conditions themselves for the answer. The work must be handled so as to attract the workman, whether salaried man or wage-earner.

C. M. Schwab says: "If managers of industry can develop some universal plan which will make labor not only well paid but happy in doing the work itself, one of the greatest possible boons to mankind will have been realized." Thomas A. Edison tells us that "Problems in human engineering will receive during the coming years the same genius and attention which the nineteenth century gave to more material forms of engineering." We have laid a good foundation for industrial prosperity. Now we want to insure the happiness and growth of the workers through vocational education and vocational guidance and wisely managed employment departments. A great field for industrial experimentation and statesmanship is opening. George H. Shepard says: "If an employer buys labor merely as a commodity, with no more feeling than he buys coal, he can expect to get just as much loyalty from his workers as he would from a coal pile with a few sticks of dynamite scattered through it."

DETAILS OF PLAN NOT OUTLINED

We will not attempt to outline in this paper the details of plans and procedure for the installation and application of the methods suggested herein. An inherent value of these plans, however, is the fact that the education of employers and employees in this application and practice is never finished. It's an unfoldment, allowing for originality. It's a progressive revelation responding to human interests, as the testimony of both employers and employees who have tried it out shows.

Representation and good will through scientific management then answers the questions of the employer and employee. And when honestly and intelligently applied it provides the industrial democracy which meets the needs of both employer and employee, and relates properly to the general public. It's a true partnership. It opens a constant source of research, pleasure and information. It puts a soul into business and industry. It's human.

Black Damp

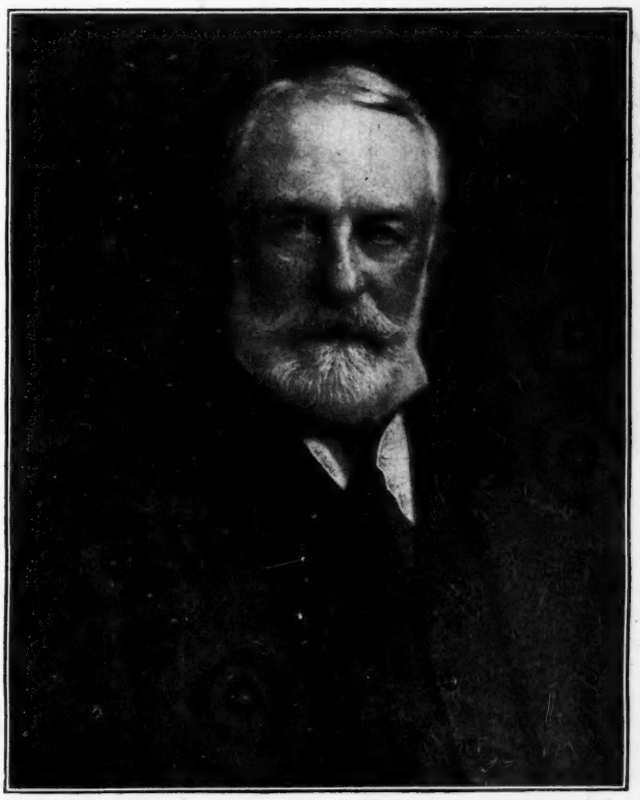
Carbon dioxide is generally called black damp by mining men. Strictly speaking, however, black damp, as Haldane, an English chemist, first pointed out, is a mixture of nitrogen and carbon dioxide. As stated before, when outside air enters a coal mine it undergoes certain changes. Among others, some oxygen is absorbed and some carbon dioxide is given off by the coal. When oxygen is taken away from the air of a room, the "air" left in the room, of course, contains a smaller percentage of oxygen and more nitrogen than ordinary air. A mixture of this excess of nitrogen with the carbon dioxide that comes from the coal constitutes black damp. Although carbon dioxide sometimes may be largely responsible for the effects produced by black damp mixtures, yet, as regards the effect of black damp on lights, it is the lack of oxygen, not the presence of carbon dioxide, that makes a light go out. Average black damp contains 10 to 15 per cent. carbon dioxide and 85 to 95 per cent. nitrogen; the proportion of carbon dioxide is seldom more than 20 per cent., or less than 5 per cent.—*Bureau of Mines, Miners' Circular No.* 14.

Coal now is being mined at the Eska and Chickaloon mines in Alaska at the rate of nearly 900 tons weekly. The Navy has not yet undertaken the mining of coal in the Matanuska field for which Congress appropriated $1,000,000.

Henry Clay Frick

AN OBITUARY

HENRY CLAY FRICK, organizer of the corporation of Frick & Co., now known as the H. C. Frick Coke Co., operating some 50,000 acres of coal lands and 15,000 coke ovens, with a daily capacity of nearly 35,000 tons, died at 5:15 a. m. on Dec. 2 at his New York residence. The financier, who had suffered from an attack of ptomaine poisoning in the early part of last month, but had practically recovered, succumbed finally to another and more serious illness.



With simple ceremony, he was buried in Pittsburgh on Dec. 5, in the same plot where lie the bodies of his two little daughters, whose death is said to have greatly saddened Mr. Frick's life. The body was escorted by a number of prominent men, the honorary pallbearers being United States Senator Philader C. Knox, Andrew W. Mellon, Henry C. McEldowney, R. B. Mellon, William Watson Smith, Asa P. Childs, Jr., Judge Joseph Buffington of Pittsburgh, and John P. Grier of New York.

The life story of Henry Clay Frick reads like another of those romances of business for which America has been notable. Between the boy born on a little farm, of hardworking, thrifty parents, meagerly possessed of this world's goods, and the man who a year ago could pay an income tax of $7,160,000, lay a span of seventy years of astonishingly successful commercial effort.

Mr. Frick was born near West Overton, Penn. on Dec. 1, 1849. His grandfather, Abraham Overholt, was a miller and distiller and the founder of what has since become one of the famous whiskey distilling houses. As a boy he disliked farming and was eager to go into business so his grandfather put him to work in his distillery as a bookkeeper. He was a pretty good bookkeeper, but that was not his idea of business. He left his grandfather's firm and went to work for Morgan & Co., coke dealers, in a rather small way. They sent him to Pittsburgh as their agent, and that was the beginning of young Frick's real career, he being then in the early twenties.

His imagination, as applied to the coke business, being more robust than that of any one in the Morgan & Co. firm, he managed to acquire a small interest in a coke plant. He saved his money and invested his savings in other coke holdings. His small fortune grew perceptibly, and he expended some of it in the building of a railroad to penetrate the Connellsville coke region. Then he started in business for himself and organized the corporation of Frick & Co.

The coke industry became intimately connected with the steel industry, and the great Pittsburgh steel manufacturers had to take cognizance of Mr. Frick. In 1882 the Carnegies took him into the Carnegie Steel Co. in the management of which he became active.

During the Homestead riots in 1892, Mr. Frick was singled out for attack by Alexander Berkman, the anarchist, and was shot twice and then stabbed three times. But thirteen days later Mr. Frick was able to get about and resume his duties in his several companies, and much to the astonishment of the world at large a pardon for Berkman was requested by Mr. Frick himself.

The loss of Mr. Frick was felt greatly, not only by men such as Judge Gary of the United States Steel Corporation, and other men who figure prominently in the coke and steel industry, but also by the employees of his plants, whose welfare had been greatly aided by the deceased financier.

Effective Use of the Cement Gun

BY DONALD J. BAKER
Pittsburgh, Penn.

THOUSANDS of dollars are being saved annually to the coal industry through the application of a cement covering to the ribs and roofs of mine entries. The majority of the "falls" that occur in entries are due to the reactions of the everchanging air on the shale, slate or superimposed rock, which causes a rapid disintegration with resultant "dropping." As a result of the roof being in this condition, timbering is necessary, and eventually retimbering. Naturally, this results in the enlargement of the entry with each successive timbering step.

The method of handling the disintegration of the roof and rib by timbering is not only expensive, but it furnishes food for the flames in the event of a fire. Furthermore, timbering makes no appreciable headway against the disintegrating process, it being at best but the means of guarding against a "fall." Quite often the best roof support is the original overhead arch of a firm slate or shale, which will eventually become decomposed.

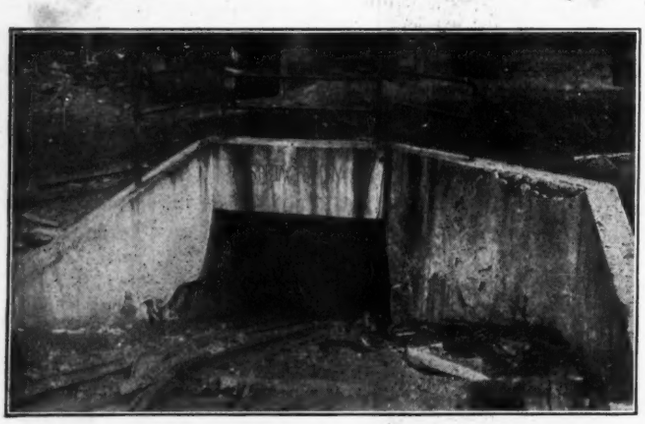


FIG. 1. ENTRANCE TO SPRINGFIELD MINE

In keeping the original top in a perfect state of preservation, the cement gun has found successful application. The worst feature of the roof decomposition is the cracks that form in the strata, as through these the air circulates, thus paving the way for a larger "fall" at some later date, with its consequent endangering of life or the temporary crippling of the haulage system at some important point. By applying a cement covering to the roof and rib the air is excluded from contact with the coal and disintegration is completely arrested. However, applying a cement lining by means of a cement gun is not restricted to entries, but the process may be used wherever it is desired to halt the reaction of the roof.

In the construction of sumps, air-tight stoppings, pump-rooms, brattices, etc., the cement gun has earned a well-deserved niche. In entry work, aside from the saving of timber, a cement covering does away with innumerable crevices and ledges that serve as places for the accumulation of coal dust. Overlooking the minimizing of the possibilities of a coal dust explosion, the factor of greater cleanliness is introduced that goes hand in hand with greater efficiency. It is possible also to stop up those places in the roof where water is continually seeping through by applying the cement dry and allowing the water itself to act as the hydrating agent in forming the cement cover. This has been done in many entries and in forming a waterproof lining for shafts.

An interesting example of a cement-lined entry may be found in the main slope of the No. 1 mine of the Springfield Coal Mining Co., at Nanty Glo, Penn. (Fig. 1.) The mine in question lies in the "Miller" bed in Cambria County and is operated by Peale, Peacock & Kerr, of St. Benedict, Penn. W. D. Dunsmore is superintendent and George Bateman is foreman. The slope is 14 ft. wide by 400 ft. long, the height varying considerably, due to the fact that soft rock was encountered in the driving. This rock has been disintegrating ever since the beginning of operations and "falls" have been frequent. The slope is on a 35 per cent. dip with the coal lying at the bottom. The mine at Nanty Glo is not a large one, having a capacity of 850 tons daily. The coal is developed on the double-entry system of heading and back heading.

GUNITE APPLIED ON THE SLOPE

From the beginning of operations at the Springfield mine trouble was experienced with the roof of the slope often resulting in the closing of the haulageway from falls of rock. Timbering had never been resorted to, but disintegration had proceeded until the width and height had nearly doubled in size over the original opening. It was finally decided to give the slope a cement covering in the hope of arresting the movement of the overhead rock. The work as carried out was primarily in the nature of an experiment. The results have been very gratifying; not only has the fall of overhead rock been completely stopped, but the slope is cleaner and gives an impression of neatness that is convincing.

A cement gun, N-1 model, manufactured by the Cement Gun Co., of Allentown, Penn., was chosen as the most practical method of applying the cement. There was no time lost at the mine, as the work was done at night. The sides and roof of the slope were given no preliminary treatment before the cement was applied other than the scraping down of all loose or overhanging rock. Two coats were put on, each about ½ in. in thickness. Air under a pressure of 50 lb. to the square inch was taken down the slope in a pipe from the compressors on the surface. Water was carried in a tank mounted on a mine car, at a pressure of which was from 15 to 20 lb. in excess of the air. An expert from the Cement Gun Co. was in charge of the operation of the gun during the first day, after which the regular employees at the mine completed the work.

FIG. 2. SECTION OF SLOPE AT NANTY-GLO

An outstanding feature in the operation of a cement gun is its simplicity of control and the small amount of time required to instruct an inexperienced man in its operation. In the work on the slope there was no appreciable rebound to the cement, the waste of materials amounting to practically nothing. As can be seen in one of the accompanying illustrations, the roof and rib are sealed off from the damaging air currents. A point in connection with the thickness of cement applied is that a ¾-in. coat should serve as a minimum to guarantee the proper unity of strength.

After the slope had been lined at the Springfield mine, the gun was further utilized in the construction of an underground pumping station. Its effectiveness was demonstrated just as clearly as in the case of the work on the slope. A brattice of rough lumber was constructed between the rib and the water at the pumproom location. Over the brattice chicken wire was stretched, forming an excellent reinforcement for the cement, which is a typical construction wherever cement or "gunite" is used over wood. The pumproom is 40x20x8 ft. high. The operation of the gun within the pumproom was entirely by employees of the mine. The result has been just as perfect as if the gun had been operated by experts. As in the case of the work on the slope, there was no waste, and Mr. McDonald estimates that but a handful of sand could be found in a distance of 20 ft. of overhead work.

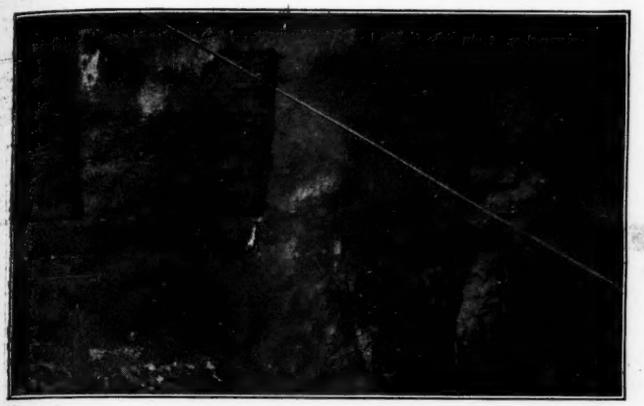


FIG. 3. ANOTHER SECTION OF THE SLOPE

Another interesting example of where the cement gun has been used effectively may be found at Red Lion, or No. 2 shaft, of the Washington Coal and Coke Co., at Star Junction, Penn. W. E. Lahm is superintendent and T. M. Zimmerman is engineer. The coal under development at that place is the Pittsburgh bed of the Connellsville Basin and has a general thickness of 8 ft. Operations at the No. 2 mine were begun in 1898, when a tract of more than 5000 acres of coal was placed under development. The main entry of the mine is on a 6 per cent. slope, which is approximately 4700 ft. long, haulage being by cable from a steam-driven engine. The remaining distance of 1300 ft. to the bottom is on a 3 per cent. grade with haulage by electric locomotives. A distance of 2 miles is recorded to the upper end of the slope, which is the extent in length of the main entry. The coal lies in a smal local basin or fold, running away from one of the main anticlinal formations. As is to be expected in an operation of this size, the drainage problem at the present time is one of no small proportions.

A centrally located pump station was constructed at the bottom of the slope, which allows practically all the water from all parts of the mine to collect by gravity. A sump, 125x10 ft., was built. Excavation was made 8 ft. below the coal and 4 ft. above, giving a total depth of nearly 20 ft., of which but 10 ft. is utilized for the actual holding of the water. Falls from the roof had been experienced ever since the sump had been built, due to the smooth overhead "checker" (local term for a slate with right-angled cleavage), slate continually breaking off and falling into the water.

FIG. 5. VIEW OF PUMP ROOM AT NANTY-GLO

A somewhat ingenious method was employed for cementing the sides and controlling the incoming water at the same time. A frame bench was built along one side of the sump and rails were placed for the passage of a car. It was necessary first to clean the bottom of the sump, as there had been from 3 to 4 ft. of sediment deposited. A trough was carried to the side of the bench and at the bottom of the sump to direct the water to the pumps and at the same time exercise a better control over it. As the structure of the frame plat-

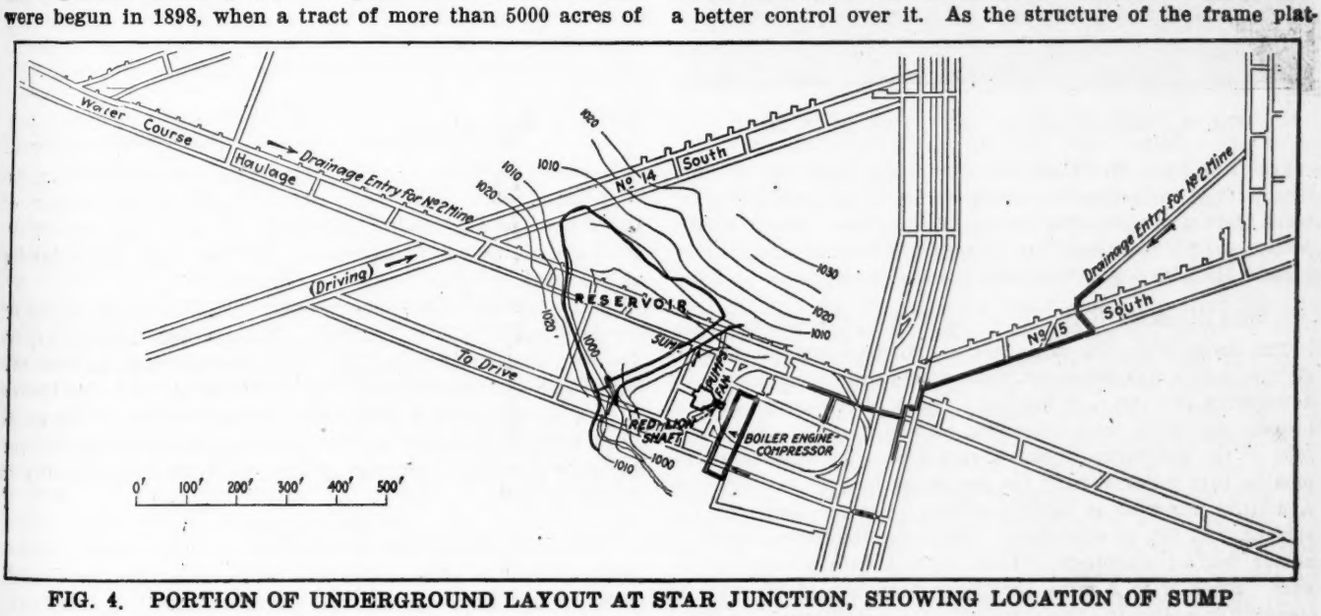


FIG. 4. PORTION OF UNDERGROUND LAYOUT AT STAR JUNCTION, SHOWING LOCATION OF SUMP

form proceeded down the sump, the sediment ahead was removed, after which the cement covering was applied to the rear. As in the case of the work at Nanty Glo, the sides and roof were first cleaned of any loose material before the cement was put on. Cement was applied from the roof to the bottom of the sump and over the floor. The frame bench was carried to the opposite side of the room when the retreat

began down the other half of the sump. A covering of ¾ in. was given the roof, sides, and bottom. A compressed air line running throughout the mine was tapped for use with the gun. The water line from the pumproom furnished the water under pressure, which simplified the operation and did away with the use of portable apparatus.

The completed sump is one of the first in the Pittsburgh district to have a cement lining. It is believed that the sump is now large enough to hold all the water that may accrue from any new developemnt work. If it is not, however, it may be enlarged without any difficulty presenting itself from the lining, as the thickness of the covering is not so great that any problem would arise from an adjoining excavation.

Because of the equipment therein, it might be interesting to note that a firm construction is necessary at the underground pumping plant at Star Junction, one of the largest in western Pennsylvania, being composed of five separate rooms, 35x15x10 ft. each. The rooms are of brick construction, four of which are of overhead arch construction, while the roof of the fifth is supported by 80-lb. rails spaced at intervals of 1 ft. Three of the rooms adjoin each other, while the other two are in close proximity. Rooms No. 1, 2, 4 and 5 contain single plunger, horizontal, Yough pumps, manufactured by the Boyts-Porter Co. of Connellsville, Pennsylvania. The size of each pump is 30x15x36 in. The No. 3 room contains an 18x10x24-in. Jeannesville pump of the same design as the others. All work against a head of 285 ft. Pumps No. 1, 2, 3 and 4 are fitted with two dischargeways, one an 18-in. line and the other a 16-in. The No. 5 pump has a separate discharge line from the others in a 14-in. line direct to the surface. All of the pumps are steam driven from a special boiler plant located directly overhead on the surface. Seven 100-hp. boilers supply the steam for operation, which is taken underground through a single bore-hole from the surface.

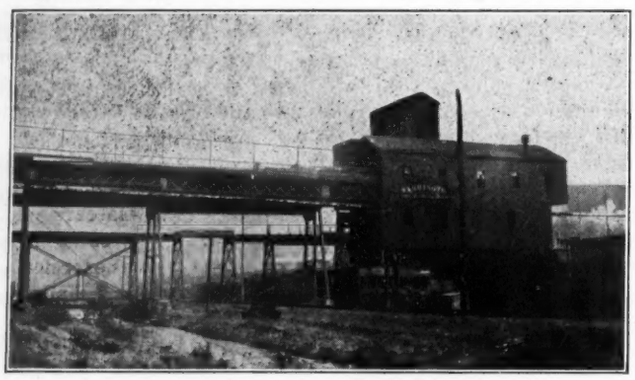


FIG. 6. MAIN TIPPLE AT STAR JUNCTION

NOVEL METHOD OF CLEANING DISCHARGE

The water from the mine has a high acid content and all of the pumps are equipped with wood-lined water ends. In dewatering the mine, it has been found almost impossible to prevent sediment from collecting on the inner corroded surface of the discharge lines. A rather unusual method of removing this material from the inside of the pipe is employed. A drilling machine is located directly over the outlet on the surface, and put in operation. The main discharge line is in nearly perfect alignment which permits this practice to be used. From 6 to 8 mine cars have been loaded at a single cleaning in collecting the refuse from the drilling. An 8000 ft., 8-in. cast-iron pipe line has been laid from the coking plant on the surface to the No. 5 pump. During the summer months when water is scarce on the surface, connection is made and water supplied for coke quenching.

Returning to the subject of cement lining, it might be mentioned that no trouble has been experienced with the cement sticking to a smooth roof without the aid of wire mesh as a background. Experiments at the experimental mine of the United States Bureau of Mines, located near Bruceton, Penn., show that a ¾-in. coat applied in 1914 has retained its original form and is in as good a condition as when first laid on. In fact, many of the demonstrations and experiments in coal dust explosions have been made possible at the experimental mine because practically all of the entries are cement lined. The heat and shock resulting from these explosions has subjected the work of the cement gun to a critical and exacting test, yet in no instance has it been found wanting. In some mines where the cement has been put on too thin, pieces of the roof have fallen, but wherever a thickness of at least ¾ in. has been applied after all loose pieces have first been cleaned off, there is yet a single instance to be reported of where a "fall" has occurred. That the United States Bureau of Mines has indorsed the employment of the cement gun is a significant fact.

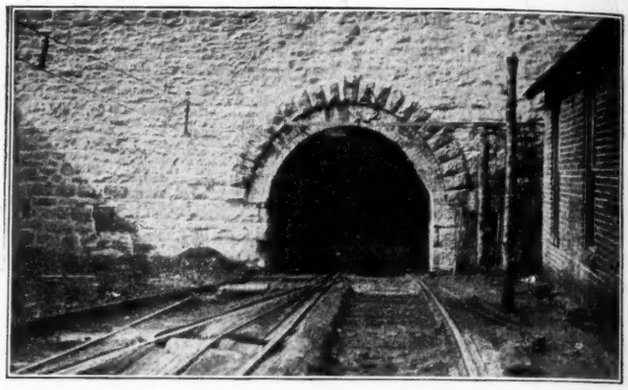


FIG. 7. SLOPE ENTRANCE AT STAR JUNCTION

The expenses connected with the use of the cement gun are quite moderate and vary according to whether the mine is equipped with compresesd air lines or not and whether water under pressure is available. By using the portable air compressor and water tank that is supplied in connection with the gun if desired, the average cost will run about 36c per sq. yd., at present day prices. This includes all materials, labor, etc. This figure was reduced in the work at Star Junction as the air and water lines were available at the point of operation.

Corporation to Export Coal

A report favoring the formation of a coal export corporation for foreign trade was submitted to the coal section of the American Mining Congress on Nov. 17 by Dr. Henry M. Payne of New York, chairman of the Coal Export Committee at St. Louis.

As to export conditions, the report said it would probably be five years before Great Britain resumed normal export tonnage, and that the annual European shortage is now 90,000,000 to 100,000,000 tons. It is estimated that the United States should have a permanent annual export trade of at least 22,000,000 tons to Mediterranean ports for 10 years, and a steady growing demand of at least 9,000,000 tons annually to South America.

With more than one combustible gas of simple molecular structure, the combined velocity of combustion can be obtained by adding together their individual velocities. However, care must be taken not to add these velocities without first multiplying each by the proper constant for that particular gas. At present not all of these constants are known, therefore it is not feasible to formulate an expression for the comparative total velocities of combustion of all the constituents taken together at several points along a flame.

Coal Mining Institute of America Holds Interesting Session at Pittsburgh

By R. DAWSON HALL
Managing Edtior, Coal Age

Synopsis—There has been no wane in the great interest shown in the Coal Mining Institute of America's annual session... In fact the institute grows stronger year by year. Dr. Thiessen introduced a new departure in the pale botanical determination of coal seams. A. W. Hesse delivered an unusually good address on "Pillar Drawing" and Prof. H. C. Ray showed how a man, well versed in metal-mining can serve the coal-mining public by taking of that industry's best and recommending it to the coal men for their adoption.

THE Coal Mining Institute of America in its meeting of Dec. 3 and 4 started its sessions at the Chamber of Commerce Auditorium, Pittsburgh, Penn., in its usual way—namely, by discussing business first and technical matters afterward. That there is no lack of interest in the business end of the program is shown by the large number of persons who were on hand early to take part in it and the keen interest they all seemed to take in its conduct.

Joseph Williams, who received 67 votes for president for the ensuing year as against E. N. Zern's 43, was elected president to succeed Mr. Zern. Mr. Williams is mine inspector of Pennsylvania bituminous district No. 10 which has headquarters in Altoona and embraces Cambria and all of Blair Counties.

In the vote for vice presidents, E. N. Zern received 85 votes; J. T. Ryan, 62; F. W. Cunningham, 54; W. E. Fohl, 52; J. B Hanford, 48; and John Thomas 38. The first three were declared elected. In his presidential address Mr. Zern introduced the subject of the nationalization or federalization of the institute, and the matter was referred by resolution to a committee, the president, E. N. Zern stating that the committee he would appoint would be the executive committee of the coming year.

JUNIOR INSTITUTES TO BE FORMED.

Another reference in Mr. Zern's address was to the badge of the Coal Mining Institute of America, the letters C.M.I.A. on a blue oval background. Much contention arose as to the proposal for the formation of junior chapters of the Coal Mining Institute in the various colleges and schools of the state. Everyone was satisfied to have these chapters organized, but the by-laws prohibited action till the regular meeting, and that is a year away.

Thomas K. Adams, the mine inspector of the third Pennsylvania bituminous district, suggested making the chapter men honorary members, but that would cheapen an honor that has been reserved for those who have been distinguished in industry and the activities of the institute. H. M. Austin would have had them made associate members, but that, again, would have created a new order of membership and was clearly unconstitutional.

E. H. Coxe proposed that a committee of five be formed to bring in resolutions regarding the matter, in which would be outlined by-laws such as could be presented and voted upon at the next annual meeting. W. L. Affelder suggested that a retroactive provision should be contained in the by-laws that would arrange for the return of the excess dues paid by those who were accorded only a junior, or chapter, membership. This plan was adopted and the resolution was presented and acted on favorably at a later session.

The election of the executive-board members resulted as follows: W. E. Fohl, 86; W. L. Affelder, 80; Moore, 63; J. I. Pratt, 63; Rush Hosler, 60; Alexander McCanch, 49; Thomas Thompson, 38. The first four were declared elected. Henry Kreisinger, fuel engineer of the Bureau of Mines, then read his paper on "Probable Fuel Developments in the Use of Coal", and the meeting, after a short discussion, adjourned.

In the afternoon session Question No. 1 was introduced, Thomas K. Adams presiding. The question runs as follows: "In a room more than 20 ft. wide, should timber be uniformly spaced between the track and the gob rib, or should they be set more closely near the center of the room than the gob."

Richard Maize, Jr. in discussing the matter advocated the placing of the props near the center of the room more closely than near the ribs and also urged that a prop should be placed between the car and the working face, saying that the mine worker, spent most of his time at that point and that many lives would be saved.

Mr. Maize wanted at least two safety posts placed in a 20 ft. place. T. K. Adams asked if there would not then be great danger of an accident when the safety posts were removed to permit the operation of a cutting machine along the face, and Mr. Maize assured him that it was his (Mr. Maize's) intention to put up another post on the other side of the machine whenever it was necessary to remove either of the safety posts.

Returning from the digression, Mr. Affelder said that putting posts close in the center of the room might tend to throw the weight on the roadway. It was stated that there was no desire on the part of any one to set posts unduly far from the road. The question was really: "How far should the post be set from the gob rib?"

J. I. Pratt said that if posts were not set within reasonable distance from the gob rib, it would shear. The chairman, quite naturally, pointed out that: "If there was no need to put props near the road rib why put them close o the gob rib, for everyone traveled along the road rib and only officials traveled along the space in the gob?"

R. D. Hall pointed out, on the other hand, that the spacing of props along the road was regulated by the exigencies of transportation, but the spacing along the road rib was at the discretion of the inspector, foreman or miner and that the props could be placed in practice as near or as far from the rib as was thought advisable. The passing of the car made a certain clearance between the road rib and the first prop in any given row obligatory, but on the gob side there was no such restriction. One member urged that an excess in the use of timber was not a mistake as the more timber placed the more could be recovered.

The next question, one for which E. N. Zern acknowledged that he was sponsor, ran as follows:

"What is a reasonable water-gauge reading for a mine operating under favorable conditions and circulating 100,000 cu. ft. 200,000 cu. ft. and 300,000 cu. ft. of air per minute?

This developed but little valuable discussion because the

pressure depends not only on the number of feet of air circulated but on the resistance of the circuit. When a mine begins to operate the resistance may be such that 300,000 cu. ft. can be circulated at a low water gauge, yet when the mine develops this will have to be increased.

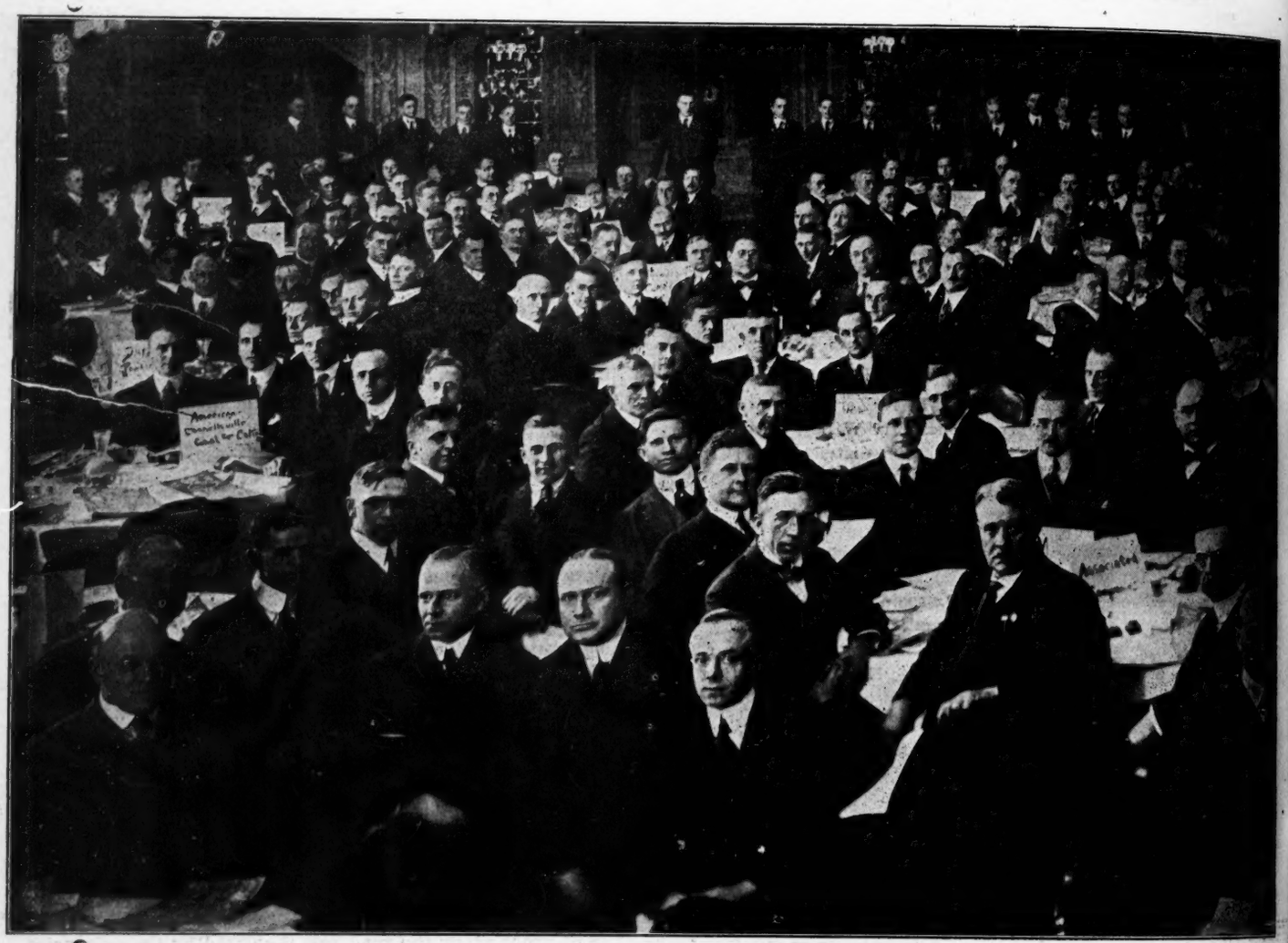
If the author of the question had made it read, "What water gauge is the limit that it is desirable to have on reaching the confines of the property when the various quantities of air specified have to be supplied," it might have been more clearly discussed. As Mr. Zern well said, when we inquire as to the resistance of a mine, we usually consider that the air will travel only those passages that are known as airways.

The air travels not only along these but along the working faces, along the rooms and through the room-to-room crosscuts. In a mine newly opened about 57 per cent of the air may so travel, and 25 per cent may take the straight road along the airways. When the mine gets older the conditions are reversed. There may be 25 per cent going through the rooms and 75 per cent through the headings.

Under such circumstances the apparent coefficient of friction being based more largely on the heading capacities will be higher than the same coefficient when the air is largely travelling rooms and not entries. The air travels slowly in the rooms, and this fact reduces the friction of travel.

Question No. 10: "What are the advantages and disadvantages of the half-advance and half-retreat method of drawing pillars?" Prof. Stoeck said that he observed that some were not using the method just mentioned while some were opening up new work in accordance thereto. The general opinion seemed to be that the plan pleased those only who desired to open up the mines with great rapidity so as to be in shape for the lake season. It was by no one apparently regarded as a scientific method of pillar drawing. It placed the work in pillaring between two gobs, and so made recovery incomplete. The panel system, wherever delays can be endured, is the safer and better plan and the one to be invariably adopted when the measure lies deep.

Dr. Reinhardt Thiessen, research chemist of the United States Bureau of Mines, Pittsburgh, read an article on "The Constitution of Coal as Seen with a Microscope." Dr. Thiessen showed how coal for the most part consists of two parts—broken wood fragments (attritus) and resins.



SCENE FROM THE ANNUAL BANQUET OF THE COAL MINING INSTITUTE OF AMERICA

In it are some of the coatings of seeds, if the expression may be pardoned. Dr. Thiessen would call them exines of spores. If he were asked, Dr. Thiessen would doubtless not admit for a minute that spores are the same as seeds.

He would declare that some years ago the idea was exploded. Spores, he would say, are nothing else than spores or the reproduction organs of cryptogams or flowerless plants. You can see them lying thickly on the underside of the fronds of the female fern. They are full of protoplasm, a substance that rots away in the coal bed leaving only the coatings or exines. They, however, robbed as they are of their included material and distorted by pressure can be readily identified by characteristic markings.

Strange to say they are of a different character in every

bed of coal. Dr. Thiessen can tell you how they look under the microscope as seen from different points of view. To him they are labels which differentiate one bed of coal from another. The Brookville bed may try to pass as the Kittanning, but Dr. Thiessen will look at the coal through a microscope, make a careful investigation of the many spare exines and tell from them, as from a Bertillon mark, what bed he is examining.

Strange to say the cryptogams of the period during which one bed of coal was laid down have spores different from those at another period when another coal bed was deposited. Perhaps it is too early to state this as a positive fact. If it is true there is a wonderful opportunty afforded of identifying coal beds where the correlation has been in dispute or analyses unusually similar.

HELD AT THE WILLIAM PENN HOTEL, PITTSBURGH, P ENN.

However, we must accept the promise with caution for the work of cutting and grinding samples is slow and expensive, and the whole United States coal fields can be covered by the xylotomist only with difficulty. In a few years we will learn if this rule is like many others—one with exceptions.

Charles L. Fay then read a paper on the "Labor Factor in Mining" urging the importance of welfare work and the necessity of sincerity and patience in its adoption. It is a fact that welfare work only pays when it is conducted with no consideration of ultimate advantage. If the employer shows more interest in welfare than he evinces in dividends welfare work pays handsomely, but not otherwise.

Question 3 was then discussed with Dr. E. S. Moore, dean of Pennsylvania State College, presiding. It ran: "How should amusements and recreation for miners (white and colored) be provided in isolated camps?" Fay spoke on the artistic perception of employees especially of some groups of foreigners. He stated that some Italian miners would come all the way to New York City to hear Grand Opera. The introduction of "rainy" films and those cheaply obtained because of their advertising accompaniment would not readily pass muster in coal camps.

One member said that the films were doing much harm throughout the country by spreading an untrue story of the wrongdoing and high living of city dwellers and of the virtues and humble living of those who live in the country. Much of the unrest is due to misrepresenting the hard-working executives of modern business life. The faults of these men are perhaps not few but it is a mistake to represent them as invariably more base and more leisure-loving than the members of the laboring classes.

C. L. Fay stated that the Davis Coal and Coke Co. had introduced Group Life Insurance, and it is received with much favor in union and nonunion mines alike. It just happened that the policies were written a few weeks before the influenza epidemic occurred, and the value of the provisions for the happiness of the employees was much appreciated.

Policies are issued for $500 after 6 months of service. After one year the policy is for $600. After the second year it is for $700. It reaches a maximum of $1000 after 5 years of service. The insurance is additional to that of

the Employees' Relief Fund and the State Workman's Compensation, but in the case where workman's compensation is paid the group insurance granted is only 10 per cent of the face amount.

Question No. 4 "Why do not coal companies employ more college-trained men on their staff?" aroused quite a little discussion. Several declared that the college men were afraid of the discomforts of hard work. One instructor declared that the West had always welcomed college-trained men and paid them well but that the East seemed disposed to seek for men who learned their work in the hard school of experience. Metal-mining engineers were better paid and more highly regarded than the college men of the coal industry. As a result the pupils at mining colleges would never "see coal mining".

THE QUESTION OF COLLEGE TRAINING

Apparently the inadequate courses of training at colleges are not the source of distrust that some would have them to be. If all the new studies so highly commended are introduced, and if higher mathematics is ditched, as is being advocated, it will not save the college man from being undesired in the mining industry. So long as he continues to hope that the industry will furnish him a white-collared job and a chance to run things from the very day he leaves college, he will find that no one will want him whether he studied cost accounting or the calculus methods of mining or conic sections.

It is the man rather than his lack of knowledge that jars—his pose, his lack of patience, his desire for ease and authority. He has sneered at his "prexy", and when he gets into the mine office he speaks lightly of his boss. He forgets that though he helped to pay his "prexy", he is drawing a pay envelope from his employer and he is surprised that the results of his self importance are consequently not what he expects. The college instructors are patient because they have to be and because they are paid for the tuition of their students; the boss is not patient, for he has to pay for the time the college man is learning to perform the task that is set him, and if the man does not justify expectations his employment is a debit and not a credit.

THE BANQUET WAS WELL ATTENDED

The banquet in the evening of Dec. 3 proved more than usually attractive. It was held in the ballroom of the William Penn. Hotel, W. E. Fohl being the toastmaster. E. W Parker, of the Anthracite Bureau of Information, here as at the American Mining Congress, advocated the method of conciliation in force in the anthracite region. Dr. Parker will pardon the suggestion that it is as doubtful a remedy for the ills of the bituminous coal industry as it has proved for those of the anthracite mines.

He also advocated the differential price rate of the anthracite region that has done so much to steady operations in that field and to make the summer a busy season in all but the most abnormal years. No one can question the advantage of a differential in price, but, as far as coal at the mines is concerned, it is possible only when there is a fixed circular. There is reasonable doubt as to the advantages of having fixed prices and of the possibility of inducing the Federal authorities to permit of such private price fixing.

It is possible that the government might set prices permanently and in the common lingo "fix" the industry as it has "fixed" the railroads by regulating the reward for rendering a service to the public without any due consideration of the actual cost of rendering that service. The word "fix" in America has acquired a somewhat ominous meaning, similar in fact to that rightly belonging to the word "spoil" and no one can say that this use of the word is not well merited, if he studies the effect of price-fixing on the railroad industry.

Dr. Parker closed by suggesting that a railroad differential between summer and winter be provided as was long ago advocated in *Coal Age*. (Dec. 2, 1916) and as was proposed at a banquet of the Coal Mining Institute on Dec. 8, 1916 by myself. Eugene McAuliffe and Van H. Manning have recently urged the desirability of the measure and the American Mining Congress has approved it. It seemed favorably received by the National Conference of Business Paper Editors in New York City, when I presented it to them on Nov. 13 of this year though no corporate action was taken or indeed suggested.

There seems to be no reason why this wise provision should not be put into effect as there does not appear to be any serious objection to it. In fact in earlier days when railroad rates were more fluid than today freights were lower in the summer than in the winter, at least on some roads.

Dr. A. A. Hammerschlag, president of the Carnegie Institute of Technology in Pittsburgh, delivered an address on the new mining school at that institution, and its prospects of creating a favorable coöperation between operators and the faculty. He had succeeded in establishing a close touch with leading mining men who are now actually assisting to direct the work of the faculty along practical lines, and he had so impressed the coal companies with the value of men, who being practical added theory to that practice, that several companies were paying for the tuition of employees whom they hoped would make for them superintendents and executives of great value.

ADDRESS BY HENRY M. PAYNE

Following Dr. Hamerschlag, Henry M. Payne made an address on the history of export associations and of the Coal Export Corporation in particular, directing the attention of his hearers to the fact that foreign trade in coal would relieve the pressure of the Appalachian coals on the more westerly markets, and would tend by the greater export demand in summer to stabilize the coal industry.

All thought seems directed toward the 306-day year and it is bound to come if the proper provisions are made and the public is duly educated to its combined duty and advantage in securing steady work, steady buying and the steady production from the large body of men in the coal industry.

R. Dawson Hall then addressed the banqueters with a few remarks on education. In his view the industry and the nation are just barely sensing the value of education and character in the progress and happiness of the Commonwealth. The physical predominance of the United States may be after all only an idea derived from the greater perfection with which the resources of the country have been examined and developed.

Russia and Siberia are larger and quite possibly physically more promising than the United States. The measure of production and the measure of exploitation and the degree to which the riches of the mine and surface have been made known cannot be regarded as measures of the actual wealth buried beneath the Russo-Siberian soil.

Moreover the people of the United States are as children eating at a table at which their elders have already voraciously partaken. There is no longer the wealth here that there was once. All that makes the United States a land of promise and accomplishment is the education and the character of the general run of people, their mental and moral equipment.

The savage lived in this land that we vaunt as a physi-

cal miracle before it was in any way despoiled and yet the savage starved to death. America was sparsely inhabited when discovered, and the people were not multiplying. Today with a people, educated and enlightened, the country is growing and the people are prosperous. For all these reasons we are compelled to believe that the greatness and happiness of the people rest most largely in their education and character and not in the land and its treasures.

Mr. Hall then referred to the mining schools that were training the future superintendents and foremen of the country for their work in the coal mines. He said, however, that industry ever lagged behind its great opportunities because it lacked a well-distributed skill.

Trained executives and foremen are all very well but they cannot make a well-rounded industry unless we have trained men to execute the work—trained men to drive rooms and headings, trained men to timber working places, trained men to care for storage-battery locomotives, trained workmen to weld and to repair, trained tracklayers to lay track and maintain it, trained electricians to bond rails and keep them bonded, to erect trolley wire and insulated lines, trained blacksmiths and carpenters and so forth.

WHAT ABOUT SKILLED WORKMEN

Where shall such men come from? They cannot all go to college but we can transform parts of our colleges into normal schools where men can be trained to teach workingmen how to perform their tasks and can further teach them safety, hygiene, care of their houses and homes, thrift, healthy living, the English language, Americanism and the principles of good citizenship. Each mine could have some such man, taught to teach, to develop men, to convert aliens into real citizens and to labor in every good work leading up to that trained industrialism without which labor is mere toil without adequate result.

Such men would transform our mining communities, make mere workmen into skilled artizans and make foreigners an integral part of our democracy, converting them from men careless of the work they perform into thinking individuals, able and willing to put mind and character into the work that they do, feeling their obligation to contribute service to America and to promote the happiness of our citizenry. To these men and their pupils might be entrusted with safety the future of our nation.

The next speaker was Mr. Ashley. Many of those assembled saw George H. Ashley for the first time. *Coal Age* has not always found itself in agreement with the brilliant geologist who with George O. Smith set the value on Western lands. But a competent man he surely is, despite his valuations and the State of Pennsylvania has reason to be proud of its choice in selecting him as its State Geologist. He will do, every one is sure, a large work in making a careful inquiry into the resources of the state.

There is oil in spots throughout the commonwealth. It is his business to indicate where it may be found in places far distant from those spots in which it is now obtained. There are other resources in large quantity that are not discovered or suspected. There are also opportunities for improving and developing our coal industry. Mr. Ashley is spending much thought and some time in looking for worthy work for which he will be justified in asking for appropriations. The public is putting before him its many problems. He will try and answer them as promptly as he can and within the limits imposed on him by the financial support he receives. He will try to hasten the topographic and geologic surveys of the state now being made, none too rapidly by the United States Geological Survey because appropriations are none too generously furnished by the state. This is sufficient cause for delay.

In securing George H. Ashley the state has annexed a vast fund of practical ideas, and the people of the state will unquestionably be rewarded thereby. That the promise of his personality convinced every one present was evidenced by the interest with which he was heard after a long session of speechmaking.

At the meeting of Thursday, Dec. 4, P. J. Walsh, one of the bituminous state mine inspectors presided over the question box, the question being: "Has the steel mine car made good"? In the discussion the all-steel car seemed to have the worst of the argument, while the steel car with wood bottom appeared to have a number of firm adherents among users. Mr. Patten said that the steel cars at the mine of which he had charge had been destroyed in nine years of wear. However, that seems to be a satisfactory term of service. The car has not been found that will have an unlimited life.

DISCUSSION OF STEEL MINE CAR

A member stated that the steel car holds 10 per cent more coal and is lighter than the wood car. While he held that the steel car had proved a failure, he declared that the composite car with wooden bottom and steel sides, that can be renewed by sections, has proved a complete success. Mr. Beck said that the sectional steel car cost only as much for repairs as the wood car. The sections when bolted together could quite readily be replaced. Mr. Little stated that at a Wellston (Ohio) mine the bottoms of steel mine cars had suffered from an enlargement of the bolts and from the sulphur-water corrosion. Mr. Smiley declared that the original objection to the all-steel car was based on its rigidity making it disposed to run on three wheels when it got out of condition. This made the car easy to derail. The composite mine car having a wood bottom is not subject to this important defect. He said that it was announced that the car makers had a non-corrosive steel that removed the objection to the steel car that in time would corrode beyond repair.

Professor H. C. Ray, of the School of Mines of the University of Pittsburgh, then read an interesting and exhaustive paper on "Modern Practice in Coal Washing" in which he described many innovations in the art of washing derived from experience in the washing of ores.

Question No. 6, "Under like conditions which is superior for attaining a large output—a drift or a shaft mine?" revealed the fact that there was a change in sentiment in favor of the latter. The advantages provided by modern hoisting and dumping equipment is steadily increasing the favor shown to shaft mines. The slope or drift mine does not start in the center of a field of coal and its one sidedness delays the attainment of a maximum tonnage. However, one could not say that there was such a consensus of opinion that from the discussion it is safe to answer the question with an unqualified approval of either drift or shaft. The question "Can electric bonding of rails be recommended as effective and economical" fell somewhat flat as no one seemed to be present who could testify as to the success attained in electric bonding.

In the afternoon question No. 8, "Is alternating current more satisfactory than direct current for the operation of coal-cutting machinery"? was presented. W. L. Affelder, who has used the alternating current for cutting coal, pumping and ventilation with direct current for locomotives, declared that the arrangement was entirely satisfactory. The alternating current, he averred, gave as little trouble as direct current in the operation of the shortwall mining machines.

Mr. Mitchell, on being appealed to for his knowledge of the use of alternating current said that, in Illinois mines,

alternating current was making large advances and prophesied that in five years the big mines would all be using that kind of current.

A. W. Hesse, chief mining engineer of the Buckeye Coal Co., Nemacolin, Penn. read a paper of great value on "Pillar Drawing", exhibiting some admirable illustrations of various methods, the Gay method being especially interesting and giving a wonderful example of longwall pillar removal, well adapted to the conveyor method of loading though used at present with hand-loading methods.

He instanced a case where the first break in the roof on the surface was over the excavated area and at right angles to the line of pillaring. He accounted for the break by saying that it occured along the line of contours.

Question No. 9: "How much coal should a coal-loading machine employing three to five men in its operation produce daily to warrant its use? Should a guarantee of performance be exacted before purchase?

Those who were using coal-loading machinery not only showed satisfaction in the work of these machines but also regarded the prospect of their further introduction with much favor as likely to remove, in large degree, the drudgery of mining. One member said that he believed that the seller of such machinery should not be required to give a guarantee because the work could only be satisfactory where the executives at the mine backed up the machine with proper facilities for its operation. If it was not given an opportunity to do its work efficiently no one could blame the machinery if it did not measure up to expectations.

A vote of condolence with the families of E. C. Lee, chief inspector of the Associated Companies, and Leon Harmon, mine foreman at Alicia, Penn., members of the Institute who had died within the year was passed by the members. The society also expressed its regret that Dr. J. A. Brashear, described as "Foremost Citizen of Pennsylvania" in the program, could not be present at the banquet because of his illness. With these and other appropriate resolutions the meeting adjourned to meet in the winter of 1920.

Taxing Anthracite

BY W. E. JOYCE

Sandy Run, Penn.

The taxation of coal lands in Luzerne county has passed the stage of moderation and is now forcing the serious attention of big mining men. This phase of mining expense has been overlooked by that department which has handled the more intricate problems, and such things as rents and taxes delegated to the land departments; doubtlessly while able men have been employed therein, the fact remains that taxation has increased to a point where, figuratively speaking, it is out of sight. An advance of 480 per cent in a comparatively short time is certainly "going some," but that figure was arrived at before this year's duplicate was arranged.

COAL DEPOSIT VALUES DETERMINED

When the first Board for Revision and Assessment of Taxes in Luzerne County was appointed, a system originally conceived by a single taxer, revised by a socialist, and perfected by this board, was mapped out. Their engineers tackled the job of fixing coal-deposit values upon a broad hypothesis based on Henry George and improved upon by Carl Marx. One of the distinguishing features of their work promises to lie in the fact that they thoroughly aroused the men higher up, and forced a closer union of the mining and land departments of the various coal companies.

The members of this board hit upon a plan for enriching the county exchequer quite as marvelous as would have been possible, had they possessed themselves of Aladdin's lamp. And yet, if these men were "top-notchers" in the work of gathering public funds, their successors have so improved upon the adopted system, that it is scarcely recognizable.

In the process of mulcting the coal companies, the new board retained the original engineering force. The work accomplished and the methods pursued are explained by the chairman of the board who, when asked how the wonderful results were obtained, said: "Yes, we have allowed for the coal taken out of your property during the past three years even if the values have increased. You see, it's this way: If it were not for the township school boards wanting so much money we would have no trouble at all with the county taxes. The county is so big and so rich no one would feel the burden of county taxes, but in the townships the school boards make their own tax levies and they make the rates high."

Responsibility for an anomalous rule is thus divided. The above explanation does not explain, however, why a property value is 40 or 50 per cent. greater after extracting several hundred thousand tons of coal from it, despite the assertion of the board that allowance is made therefor by the new system.

The engineers stand by their work and the members of the Board of Revision are no less loyal to the system. The land agents handling the tax question in the past for the various coal companies failed to secure an application of the new tax system on an equable basis. The mining heads are now figuring on giving them assistance.

When the triennial valuation was arranged for tax purposes the old board of revision believed they had performed a good job because they had increased valuation 400 per cent. That did not satisfy some of the public bodies drawing upon the fund and the following year a readjustment was secured. That the law did not allow changes of an arbitrary nature beyond the triennial year made no difference. They simply ordered a readjustment, and means were found for increasing the rate without disturbing coal areas.

In the succeeding efforts at readjustment tracts of coal land that bore the full burden of taxation in 1918 were relieved of that responsibility, and tracts previously reported as barren were used to take up the difference, with different rates for the same beds on different tracts. Thus the scientific features of engineering were embellished and the coal companies are ordered to pay accordingly.

The taxes paid by one of the large companies now amounts to 20c. per ton on its product. As it requires a tonnage of some 10,000 per month to yield such a profit, there would appear to be good reason for activity and closer inquiry on the part of the various departments in order to ascertain just tax on coal.

The higher commercial value of liquid fuel is due to its being available for more purposes. Oil seems to have all the advantage of gas and solid fuel and none of their disadvantages. Gas, on account of its simple molecular structure, can be burned readily and without smoke in any commercial apparatus from a boiler furnace to a gas engine; also, the feed of gas can be made automatic for any apparatus and can be easily controlled. However, gas has the great disadvantage that it is not concentrated enough for convenient storage. On the other hand, coal contains large amounts of heat in highly concentrated form and can be easily stored. Its complex molecular structure and the many solid impurities tend to limit its use. In its marketed form, coal lacks sufficient adaptability to delicate adjustment or automatic feed control.—*Bureau of Mines Bulletin No. 135.*

Modern Pillar Drawing Practice*

BY A. W. HESSE
Nemacolin, Penn.

WE formerly thought a 1000 or 2000-ton production from a mine was going some, and you have probably noted the advertisement the Illinois mines have been receiving as the biggest producers of the world, yet at Lynch, Harlan County, Kentucky, I am told that a year after coal began going over the tipple, 5000 tons per day was the output and 15,000 tons per day is to be the capacity of the plant! Several openings, however, contribute to the one tipple. Nevertheless, this goes to show that we are setting a rapid pace for the world's production of coal, and in this period of unrest and policy of conciliation, when nobody wants to work and the law of supply and demand still rules, who knows but what necessity will bring forth methods of mining and mechanical means whereby the miner may sit at the entry and direct his car to the room face, or pillar stumps, and tally it as the car goes out.

Synopsis—Pillars in mining operations contain from 60 to 75 per cent. of the available coal. Attaining and holding a large output figure can only be accomplished by highly effective methods of pillar drawing. The various practices of removing pillars are discussed in this article.

The straight work, or entry driving, has been receiving considerable attention by the mechanical minds of the country to speed up development and output; but since the pillars of a mine in which the maximum recovery is sought represents from 60 per cent. to 75 per cent. of the coal field, it is worth while to give this phase of mining considerable thought before the mine work is projected. Of course, there are some things for which the mine management is not responsible, such as the impatience of the Board of Directors for early returns; but it is possible in nearly every case to become familiar with the physical and chemical properties of the coal and the coal-bearing strata to such an extent as to forewarn the operator of the things which might happen when he comes to drawing pillars.

We know there are two general systems of coal mining: Room and Pillar, and Longwall. The longwall system contemplates the entire extraction of the seam without leaving pillars, and inasmuch as this method is a subject in itself, no attempt will be made in this paper to treat of it.

MARGIN OF PROFIT INTERVENES

In room and pillar work, the margin of profit determines just how far we should go in our efforts to recover the pillars allowed to stand in the first mining. That is the foundation of all good business. But there is considerable diversity of opinion among mining men as to the proper plans to follow preliminary to drawing the pillars, and it is very probable that exceptions will be taken to what I may present; but this paper is founded upon observations of different plans tried and it is just possible that somebody may get some good of it.

There are several factors that affect pillar drawing which are not new but worth repeating, namely:

(a) Mining Rights and public feeling; (b) Labor conditions; (c) Incompetent management; (d) Impatience of owners for quick returns—previously mentioned; (e) Market value of coal; (f) Insufficient or incompetent engineering; (g) Movement of mine cars or cars per man per day; (h) Width and capacity of mine cars; (i) Weight and character of overburden; (j) Roof and bottom conditions.

*Paper presented before the Coal Mining Institute of America, Pittsburgh, Penn., Dec. 3 and 4, 1919.

The first of these factors represents a condition imposed upon the operator by the deed or lease he holds, or the laws of the State in which he is mining coal. If he cannot break the surface, then the only way he can draw the pillars is by substituting some artificial roof support, which is now the practice in the anthracite field, by flushing in the culm considered waste. To use sand or gravel for this purpose is uneconomical, and to use ashes brings up the problem of supply. This method of flushing culm is described in the Coal and Metal Miners Pocket Book, page 314. As to drawing the pillars, the process consists of simply splitting them.

The second factor has to deal with labor unions who dictate how wide a room must be driven, whose wage scales do not cover drawing of pillars and make the cost of driving safe places prohibitive; so that must be passed up also in the final judgment.

The third factor is readily understandable by all, for unless a man is familiar with the details of any scheme, he cannot do justice to the work nor to himself.

The fourth factor, I believe, is applicable only to the smaller sales companies; at least there is a growing tendency to give the mine manager an opportunity to line up his work safely before furnishing too much room coal or "hogging" out the field.

Fifth: There is considerable to be said about the market conditions affecting pillar drawing, especially when the physical conditions of the mine are bad. There was a time when I believed it unwise to attempt to draw pillars in all cases. This conclusion was based upon the cost of production at five mines working the Pittsburgh bed, measuring 6 to 7 ft. thick, on the room and pillar system. One mine, as an example, was the first to feel the effects of dull markets that called for off days. The men were hard to hold while other mines continued to work. The roof is composed of soft shale and boulders and fire clay bottom.

LAW OF DIMINISHING RETURNS

For eight years the cost of production was followed. The first three years, the costs ran about the same, the pillar extraction amounting to only 9 per cent. of the output; the following year, pillar extraction increased 12 per cent. with an increased cost of 9 per cent. and a drop in recovery per acre to 84 per cent. This diminishing return continued through the balance of the 8 yrs. with corresponding increased costs until the increase amounted to 62 per cent. of the initial cost, notwithstanding the fact that the net actual increase of mining and loading in this same period amounted to only 10c. per ton! The rooms were first driven on 50 ft. centers and 250 to 300 ft. long, but owing to difficulties in maintaining roof, the length of rooms was shortened and room centers increased to 80 feet.

The overburden being only about 200 ft., these pillars appeared ample, and were, so far as protection went; but it was seldom that the roof remained intact long enough to permit completing the rooms and drawing out the pillars, and from the time the room was completed it was clean up, retimber, cross-out and split, until the pillar was out. Even

10 ft. places made little or no difference in holding the roof; besides, room work went faster than pillar drawing, which, together with off days, helped make matters bad.

Sixth Factor: Some of you may wonder where a mining engineer can come in on pillar drawing. Until a few years ago he was considered a necessary evil, as he added to the expense, and all he was good for was to follow the mine foreman's workings and put them on a map to keep the District State Inspector informed as per the law. I could give you reproductions of actual mines where the driving of rooms left the pillars in such conditions that it would take a superman to draw them, owing to a large rib on one side and

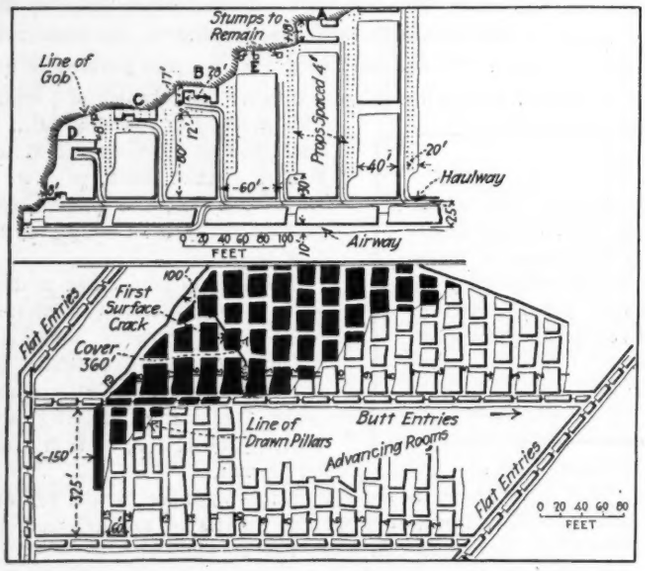


FIG. 1. SHOWING MEETING OF CUT THROUGHS

practically no rib on the other, or too light a rib under heavy cover, or rooms to the dip with ribs standing in water. Also, has it occurred to all of you that there is a relationship between the percentages of coal taken from entries, rooms and pillars which must be observed for economical production?

The developed area of a field is that coal directly tributary or accesible to the entries driven. Every year this area should show at least the acreage equal to the sum of all the coal acreages extracted until the field is fully developed, otherwise you will soon be in a position of redeveloping your mine. Also, if the room pillars amount to 53, 61, 67½ or 78 per cent. of the area off the butts, then the pillar drawing should amount to those percentages respectively, otherwise there will soon be standing rooms to repost or clean up, if nothing more serious occurs, when the time for pillar drawing is possible. These conditions should be shown yearly by the engineer and the operator should observe and appreciate their values.

A BIG FACTOR OF SUCCESS

Seventh: No doubt the mine inspectors present here today have visited working places in the mines and found men sitting around waiting for cars. It is a prolific source of discontent and a source of danger for the success of pillar drawing especially. There is a mine in the 16th District of this State achieving wonderful success in drawing pillars, and half of it, I am told, is due to the rapid movement of mine cars and keeping the miner supplied. You must either increase the equipment or move it faster to accomplish the desired end.

Eighth: One of the first things I learned in regard to pillar drawing was in driving the room to keep the track as near as possible to the rib intended to be brought back on that track and to set the first line of props as near the track as feasible for the free movement of the mine car. The tendency of the age is to increase the capacity of mine cars as it means so much to the haulage in large producers, but where the roof conditions are bad this means increasing the distance of the span between the rib and the first line of posts and spreading these at the turns into the cross-cuts or "scutching" the rib corners, which makes each turn a source of danger from falls or greater care must be observed in timbering.

Ninth: The weight and character of the overburden naturally affects the size of pillars to be left for protection. The Coal and Metal Miners Pocket Book gives different authorities' views and tables on pillar sizes, but my opinion is that with pillar drawing in view these sizes are all too small. You, who have seen pillar drawing under conditions of a creep would not take chances on a 20x66-ft. pillar for a 350-ft. depth, nor 42x78-ft. pillar for 1000-ft. depth. I have seen smaller pillars drawn successfully under covers up to 400 and 500 ft.; but it leaves no factor of safety, and one stump lost may be the nucleus of a general squeeze. One mine in the Fairmont Field lost the whole one side of its workings in one night, losing mine cars, men's tools and everything else which happened to be in that side, due to squeeze. Some of you may recall the Twin Shaft disaster in the Wyoming Region of this State, where men were buried alive and never recovered. Therefore, it is a good rule to adopt pillars of a size which will leave you "better safe than sorry."

The roof and bottom conditions have as much affect upon the selection of pillar sizes as the overburden. I believe I am safe in saying that with a few exceptions all coal seams are underlain with fireclay. This may be hard as rock when the coal is taken out, but moist air soon starts a swelling and gradual disintegration. I have seen this occur as early as two months after an entry was driven. If the roof be poor and pillars small, there will be a driving down of the pillars, heaving of floor, causing at the same time a roof movement which soon fills rooms and entries with slate. In the case of sand rock roof, which is hard to break, large pillars of

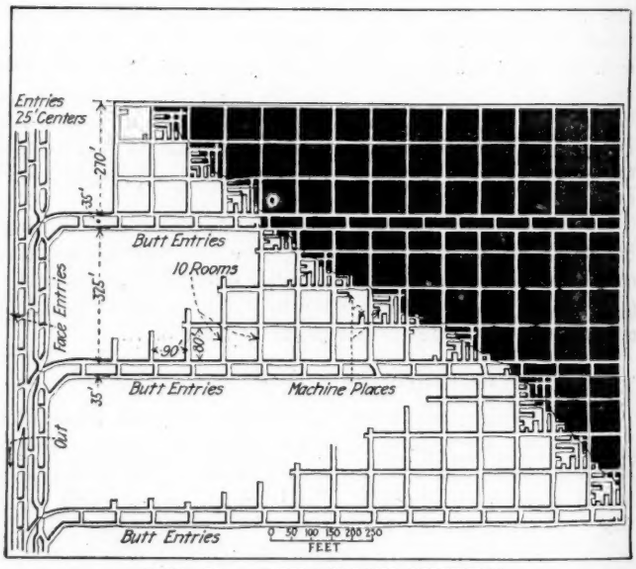


FIG. II. THE BLOCK SYSTEM

coal are necessary to avoid crushing when carrying the additional weight thrown onto them temporarily by the extraction of pillars behind until the break occurs.

I have seen excellent pillar falls behind such work as you see in Fig. 1, and the fact that a surface crack appeared a trifle over a year after the pillars were started back showed clean work. The peculiar direction of the break in relation to the mine work was probably due to the fact that the contours of the surface just about paralleled the break. Never have I seen the surface break even with the edge of the pillaring which covers over 50 feet.

The rooms advancing made about 36 ft. per month, while the retreating pillars made on an average about 23 ft. per

month. The entries were driven from both flats, thus making it possible to start driving upper rooms as soon as reached. The work here shown is so lined up that barrier pillars between panels are eliminated and the rooms of one butt drive to the gob of the next. Even the chain pillars can be drawn from the rooms driving through.

The details of the method of drawing these pillars are shown above; and these methods can and are followed in other systems than the one here given. At "A," the machine cuts the coal about 4 ft. back from the end of the rib for a width of 10 ft. This place is driven by machine half through

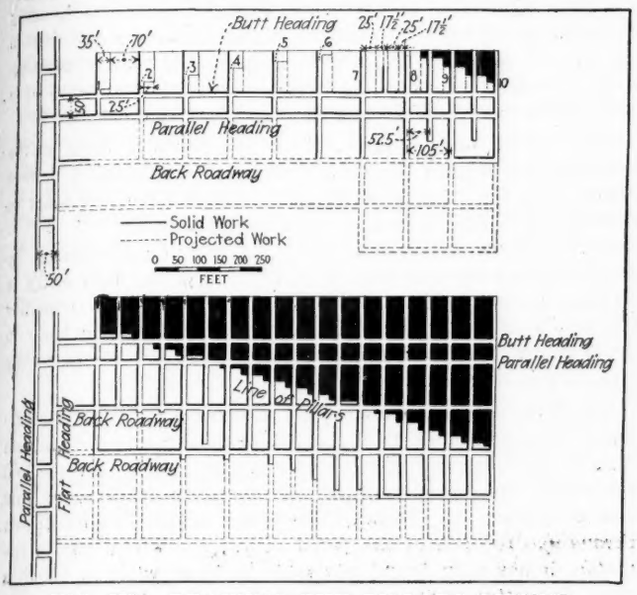


FIG. III. DRAWING THE PILLARS BEHIND

on a slight slant toward the rear, then turns and cuts through to the gob. When the machine man comes back, he takes a cut on the face, swings his machine and cuts through the stump as shown before leaving the spot. This leaves four small stumps to be removed by pick, which was always rather difficult to get away with, as the miner could not trim down one stump without throwing additional weight on the already heavily burdened remaining three stumps. This practice, I believe, has been abandoned, and is not recommended.

At "B," where the crosscut caused the condition making it impossible to cut another place through the 17-ft. stump, a slab is taken out for a distance of about 28 ft. before the cut is made through to the rear gob. The track is swung over and more props set for protection. The rear stump is trimmed down by pick work and another cut-through made to the rear gob by machine, conditions permitting. After the stumps are trimmed down, a situation as shown at "E" is allowed to remain until the weight of the overburden crushes these stumps. When the pillar drawing reaches the haulway, an 8-ft. place is started through the heading stump, leaving an 8-ft. barrier on the inby side, while the stump is being attacked at "D."

The chain pillar is drawn from a track laid up the airway and the same system of leaving about 8 ft. of coal behind the cross-cut is followed here also. You will note that the entries are driven on 25-ft. centers and in my entire experience in the Fairmont Field, practically no trouble has been observed in protecting the headings; and the cut-throughs were made without putting in curves. However, by increasing the centers to 35 ft. it has been found more expedient, in case of falls, to take a skip off the rib than to clean up the slate, and I believe these centers on butt or room entries have been pretty well adopted.

Owing to the greater depths being reached and the desire for more machine coal, a block system of mining has been advocated for the Fairmont Field, which is shown by Fig. II. Since the West Virginia Mine Laws reguire cut-throughs not over 90 ft. centers, the rooms are laid off the same and the cross-cuts in the rooms likewise. But instead of making the rooms 20 ft. wide as commonly done, they are driven the same width as the entries. The intention is always to start the rooms at the rear first and pull the pillars as soon as the rooms finish, being careful to line them up to leave as much protection on the outby side as necessary. When the room is finished, a cut-through is started about 8 or 10 ft. from the end of the last stump, at the same time a cut-through is started from the first cross-cut back to drive up through on the face, leaving about 8 or 10 ft. on the right. These cut-throughs meet, leaving two slabs to bring back, which is done as shown by details of Fig. I.

By this system and using 8-ft. cutting machines, it should be possible to load out about 600 tons per day off one section, by cutting, drilling and shooting at night. This also means keeping the loader supplied with cars.

The system just shown is similar to the concentrated method explained by Mr. W. H. Howarth in a paper read before this institute in December, 1916, in which he tells of the remarkable success attained at the Bridgeport mine of The H. C. Frick Coke Company. Fig. VI shows a layout of this system, and you will note that the blocks are 90 ft. square, whereas the West Virginia blocks are 80 ft. square. The estimated daily output expected from each section amounts to 705.6 tons at this mine, which is the more remarkable for pillar drawing, as a great many mines do not get this on room driving.

There is one thing, however, to be noticed about this method which may be affected by roof and bottom conditions, mentioned in factor 10, namely, there are practically 10 butt rooms driving off each face room at the same time, leaving 15-ft. pillars for support just back of the gob. As the late

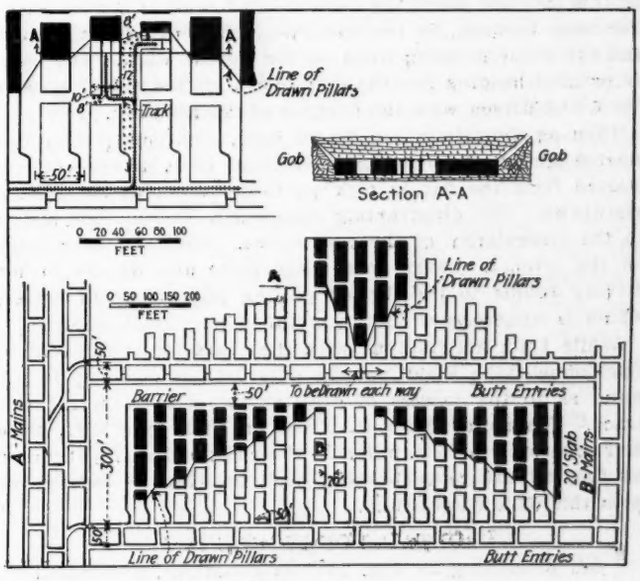


FIG. IV. TWO METHODS OF EXTRACTION

Mr. Keighley has said, "In deep mines after the ribs have been drawn back 100 or 200 ft. from the point where the rib-drawing started and a general fall or movement of the roof occurs, the rupture or disturbance does not run up more than from 5 to 30 ft. above the coal.

Very often such falls not only take place in the large open spaces where the coal has been withdrawn entirely, but extend into the roof of both rooms and cross-cuts for 100 ft. or more back from the rib line. Why, then, would it not cause considerable cleaning up and timbering in these short butt rooms or cross-cuts in the concentrated method, unless the roof were good?

Mr. Keighley offers a remedy under these conditions in the plan as shown by Fig. III. The object of this method is to drive the rooms only as you need them and draw the pillars behind, following the advance of the rooms and using the cross-cuts for new haulways as the former ones are destroyed by pillaring. This should reduce the consumption of props, if the rooms are not advanced too rapidly.

The end of the area to be worked is reached before any room entries are turned off the face or flat entries. As the

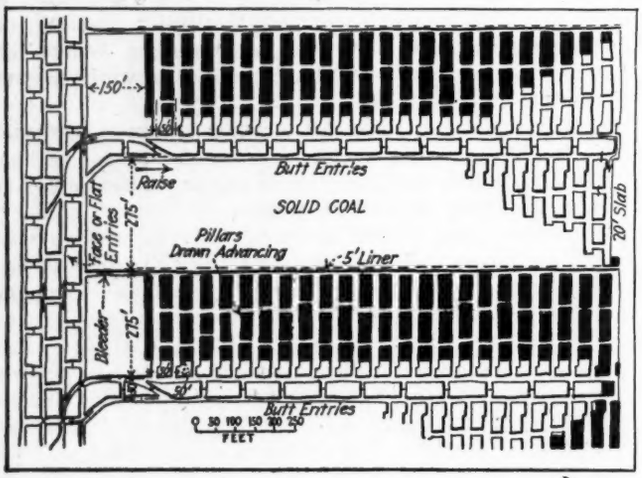


FIG. V. HALF ADVANCE AND HALF RETREAT

butt entries advance, 105 ft. distant and parallel to the edge of the area, rooms 10 ft. wide are turned off on 105-ft. centers and driven to the boundary. When completed, a 25-ft. slab is immediately brought back to within 30 ft. of entry and room allowed to cave. When the last room is reached and driven off this side and about the time the 25-ft. slab is started back, the room between, or the split, as I shall call it, is started and the pillar drawing lined up for retreat work. The back or parallel heading has the first rooms started opposite room No. 6 and driven with the advance of the headings.

Then as the pillars are drawn back, additional rooms are started ahead of them. At the same time, a cross-cut is started from the flat to pick up these rooms as the pillars are drawn. The disadvantage apparent in this method is due to the irregularity of the coal seams. While we may start on the level, a change soon takes place and we are either driving rooms to the dip or pulling pillars out of water, which is unnecessary in the methods previously shown.

While I am not familiar with the character of the coal in the Connellsville Field, yet the question has come up in my mind as to the success of drawing two ribs from the one track. You notice the 95-ft. blocks are split by a 10-ft. place and apparently a 25-ft. pillar on the right and a 17½-ft. pillar on the left are to be brought back together. I have never seen this done successfully.

DETAILS OF FIGURE IV

I am presenting by Fig. IV two situations, designated by A and B, which sometimes arise, where a pair of butts is driven from two face entries and the grade permits hauling each way. If the first pillar is drawn at the middle of the panel it can be attacked from two tracks and a fracture line established to draw pillars on the retreat, allowing double the number of men to work on this butt and adds the chain and barrier pillars to the others to make it worth while sending in a motor.

In the situation presented by "B," it is evident the rooms were driven advancing and fearing caves, the pillar work followed advancing also. Eventually the pillar work met at a point, with the weight thrown onto the depreciated block of coal between; and one of these tracks had to bring back two ribs. The result was: a situation as presented in the upper left-hand corner of Fig. IV and the section A-A of same. Roughly, I figure across this 52 ft. of coal there must have been at least 8 tons per sq. ft. of weight, and Mr. Chas. Enzian in his investigations of artificial roof supports found by compression tests on various material that 8 tons per sq. ft. would compress a pile of large-sized broken sandstone 10 per cent. rectangular piers of mine rock nearly 20 per cent.; so you may readily understand that this section of coal was constantly under serious compression, and I know that it was a race to keep ahead of trouble and the percentage of recovery was lower in this section than in others of the "A" line up. Besides, when the pillars were brought down to heading stumps, the number of working places gradually reduced to three: a heading stump, chain pillar and barrier. These required about 3 years to extract if drawn all one way, or a year and a half if split and pulled in opposite diections.

Man should have a good reason for doing a thing or he certainly has a good reason for letting it alone, and I believe there are many things not apparent to us when we start to criticize another's system of drawing pillars.

Some may think it cheaper to do additional cleaning up and reposting than to wait until the end of the butt entry is reached before starting to drive rooms; some may consider it cheaper to pump and take chances of losing men than to drive another pair of butts in order to turn the rooms to the rise. Thus it goes.

Fig. V shows a method of "Half Advance and Half Retreat," which means the half of the panel has the rooms driven and pillars drawn as the entry advances and at the extreme end the rooms on the parallel or back heading are started and ribs drawn on the retreat. The latter rooms can be driven through to the gob of the panel below, but where gas is liberated, it has been found advisable to leave what is called a liner, consisting of about 5 ft. of coal at the ends of the rooms, along which the air travels to a "bleeder" cross-cut to the return main aircourse. On the advance the roof is broken

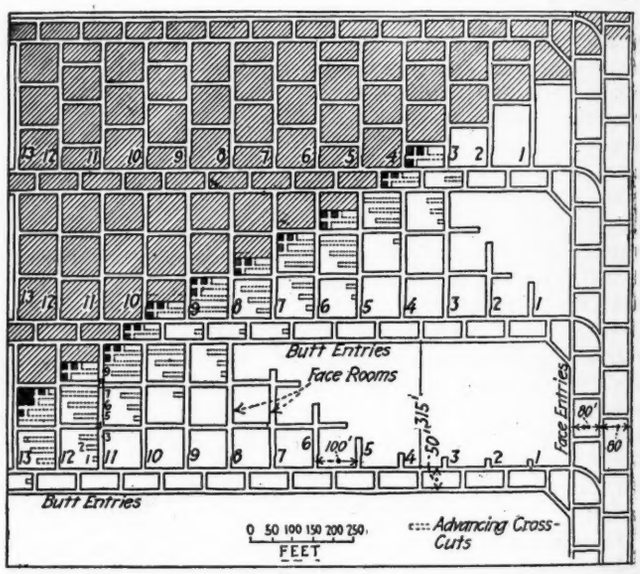


FIG. VI. SHOWING BLOCKS 90-FT. SQUARE

against an immense block of coal, and unless the roof is extremely friable will leave a space next to the solid coal for the air to seep through, thus ventilating the gob. When the set of rooms from the next butt drives up and pulls back from the liner, the assumption is that the roof will have settled in the old work to such an extent as to protect this 5-ft. barrier and serve as a weep hole for the air to get back to the main aircourse.

I believe this method is employed by the Pittsburgh Coal Company in some of its mines with smaller room centers than

here shown, evidently with success or larger pillars would be used; also the dewatering of the rooms and pillar work must compare favorably to that of driving another pair of butts to get one set of these rooms and pillars.

A modification of this system is to drive three entries, using the middle entry as a return airway and overcasting to the main return.

For extracting coal under a sandstone or thick hard slate, a method with attractive results is employed by The Gay Coal and Coke Company in Logan County, W. Va. Figure VII shows a general and detailed plan of the process of recovering the pillars. As the roof consists of heavy sandstone, rooms may or may not be driven with the advance of the entries, as they are spaced on 100-ft. centers and driven only 10 or 12 ft. wide. When the butts reach their limit, a longwall cutting machine is employed and the 90-ft. room pillars are attacked at the upper end by "skipping" the pillar for the entire length of the room. As each skip is loaded out, the track is moved over and the machine takes another cut. Each machine cut is followed by an electric drill and shot

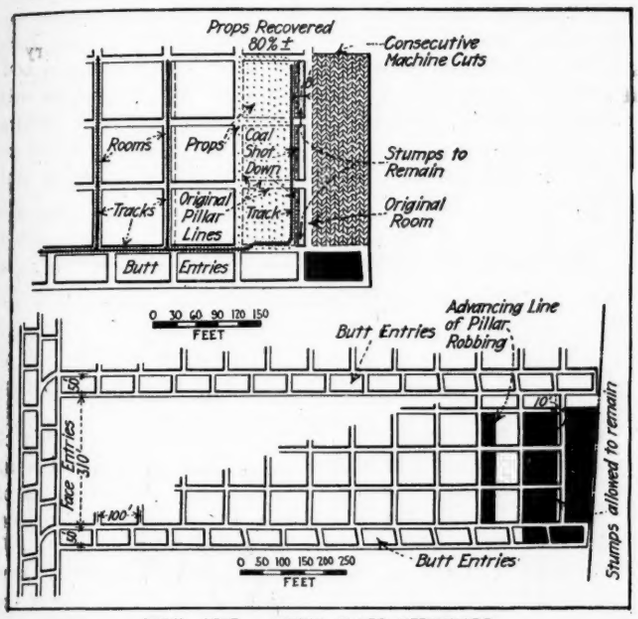


FIG. VII. THE GAY SYSTEM

firers. When the pillar is reduced to 10 ft. it is split at about 150 ft. from either entry and as much as possible is drawn each way, but not much is recovered.

I have seen the roof break made by this process, and it compares favorably with anything produced by other methods. The coal is 6 ft. thick and from one entry the usual run is 500 tons per day. Strange to say, foreign labor will not work on these walls and "green" labor will load from 16 to 18 tons per day per man. At one time 20 tons per man per day was quite common for a day's run.

ADVANTAGES OF THE METHOD

The recovery by this method is about 89 per cent. and the advantages claimed are: Lower cost of production; a larger output per dollar invested; concentration of operation; employment of more mechanical devices; more efficient supervision; less accidents.

The last is proven by the fact that nearly 2,000,000 tons of coal have been removed without the loss of a single life!

In the pillar drawing of thin seams, yardage of course affects the size of the pillar; besides, the law of the "ratio of slenderness" applies to coal pillars as well as to steel or timber columns, but not to the extent imagined. The main advantage in pillar drawing in thin beds is that it takes less time and distance to close up the space between floor and roof line to take the weight off the pillars behind. However, with heavy cover and excellent roof, it is advisable to keep ample coal area behind the drawing pillars for squeeze protection.

There are some general points to be followed in all cases of pillar drawing, but every mine has its individual conditions, and a study of results obtained at other places with a comparison of the factors heretofore mentioned may be the means of solving others' troubles.

Nearly all mining men are advocates of driving all entries to the boundaries before driving rooms and drawing pillars in order to get all coal on the retreat. There are very few instances of companies carrying out this policy, and the only one to my knowledge would not recommend, or if it had the work to do over again, would adopt this system. This particular mine has about 30 or 40 ft. of white sand rock over most of the coal, yet it scaled off and in places where draw slate came in it was worse, so that by the time they were ready to mine on the rooms and pillars, the entries had to be cleaned and reposted and changes made in the system to speed up production caused by the delays.

Therefore, with the ordinary type of roof it is probably wise to take the sections necessary for the desired tonnage and develop correspondingly, so as not to keep territory outside of the mains open too long.

I have considerable correspondence in my files relatives to the recovery of coal in the different fields of the United States, showing recoveries from 50 to 97 per cent., and I could possibly interest you with some of the details; but I have found that the best impressions are made by actual visits to mines in which successful pillar drawing is in progress, and certainly I could not conclude this paper with better advice.

Electric Lighting at the Working Face

The mines of the United States Coal and Coke Co., at Gary, W. Va., and Lynch, Ky., are lighted throughout with electricity. Along all haulageways, including all room headings, the lamps are connected directly between the trolley wire and the rail, using three 100-volt lamps in series and spacing them at intervals of about 100 ft., the lamps being connected by weatherproof wire.

In the rooms the lamps are hung in sets of three, suitably spaced along the face suspended from the posts. The lamps are connected by a duplex weatherproof cable of No. 14 wire to the trolley wire at the mouth of the room. The proper length of cable to extend the full length of the room is placed on a light wooden reel, which can be moved up as the room advances, paying out the cable as it is brought forward. Forty-watt Mazda lamps are now used, three 100-volt bulbs being used in series, as the voltage frequently rises to 290 when the load is light. The illumination, of course, fluctuates with the voltage but is much better than that of carbide lamps and is much appreciated by the men using it.

The exact manner in which coal absorbs oxygen is not clearly understood. A solid substance can hold gases actually dissolved in its interior. With coal, the absorption of oxygen is complicated by the fact that, in addition to this physical action, there is also a very complex chemical action. Part of the oxygen is converted into water, part into carbon dioxide, and part is retained as combined oxygen, producing compounds richer in oxygen than the coal itself. Part of the carbon dioxide is retained by the coal, for coal at ordinary temperatures has an enormous capacity for holding carbon dioxide.—*Bureau of Mines, Bulletin* 105.

Necessity for a Mining and Industrial Education

BY H. H. STOEK†
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Synopsis—It is becoming more and more the tendency of the principal coal mining states to give educational tests to workmen in mines and to issue certificates of competency when merited. In addition, vocational educational work is receiving attention, war practice in this respect furnishng an object lesson. The Smith-Hughes Act became operative in 1917 and its workings, as well as that of the U. S. Educational Bureau and Board, are fully explained. The purpose and administration of the Smith-Hughes Act especially are gone into in detail; considerable progress has resulted from the operation of this act along agricultural-educational lines, but as yet much less in industrial and trade lines.

During the period of the war the necessity of getting out a maximum amount of coal (often with a minimum number of men) led to the employment of men insufficiently trained to combat the dangers of mining and to produce coal efficiently. In spite of this handicap, the output of coal during the war period was most flattering, both to the miner and to the operator, and showed what could be done under the urgent conditions prevailing, particularly with the stimulus of patriotism behind the industry.

Never before has the importance and value of training and skill been better appreciated than now, and various tests given by the Government in selecting men for special duties have given great emphasis to the fact that there is material difference in the aptitude of men for various kinds of work. One of the prominent and most important topics under consideration by the industrial and educational world at the present time is what is known as industrial or vocational education—that is, such education and training as will produce more skilled workmen, better foremen and bosses, and will give also a better general knowledge of the coal industry (for example) to the whole population. The necessity for such training is not confined to any single industry, to any particular locality, or to a nationality of workmen.

EDUCATIONAL TRAINING DIFFERENT FOR MINERS

The various operations in a mine and their supervision are carried out under conditions different from those that exist in an ordinary factory. In a mine the men work in small groups, usually not more than two in a place, and these groups are frequently fairly widely separated, or at least not within seeing or speaking distance of each other; hence, it is impossible to have that close supervision that obtains in a factory or shop where the foreman can see a large number of men from a central point, where the dangers are common to all and where each one can get prompt assistance from his fellow workman, if needed. It is possible in a mine for a man working in a room alone to be injured and not be discovered for a considerable period of time. It is therefore important that all employees about the mines should be so trained that they can best take care of their own safety and not prejudice the safety of their fellow workers; and also that the coal may be most efficiently mined.

In connection with coal mining, there are several reasons why vocational education is urgently needed; possibly even more than in some other industries. Foremost among these reasons is the fact that mine laws in practically every coal-mining state of importance prescribe certain educational tests that must be passed by any one aspiring to a position of authority, and in at least two states—namely, Pennsylvania (anthracite region) and Illinois—every miner must hold a state certificate before he can work at the face. Having thus set up an educational standard, it is only just that the state should provide some means by which the men engaged in mining and the young men who aspire to become miners may have assistance in preparing themselves for the tests prescribed by the states.

In 1870 the legislature of Pennsylvania passed the first general coal-mine law for the anthracite mines of Pennsylvania, and this law provided for the appointment of mine inspectors based upon a state examination. In 1885 the legislature of Pennsylvania provided that mine foremen, assistant mine foremen, and firebosses should pass an examination before being granted certificates of competency. Other coal-mining states have since passed similar legislation, and now practically every state of importance in coal mining as well as the Canadian provinces and European countries require an educational test. In fact, there is probably no other industry so surrounded by educational qualifications as is coal mining.

CERTIFICATES OF COMPETENCY ARE ISSUED

The positions for which examinations are required, in order to secure certificates of competency, are briefly as follows: Mine inspector, mine foreman or mine manager of the first or second class, fireboss or mine examiner, hoisting engineer, shotfirer and miner.

In the United States and Canada the following number of men were examined during the years noted, the figures being the totals for the foregoing positions with the exception of miners, the figures for which are not available: In 1904, 2,046; 1906, 1,740; 1909, 4,595; 1912, 3,790.

No later figures have been compiled, but those given show that even for the supervisory positions about the mines the demand is great; while if the miners examined could be included, the total would be increased. This educational requirement is not local, but widespread, as is shown by the fact that in 1912 examinations were held in Alabama, Illinois, Indiana, Iowa, Kentucky, Montana, Oklahoma, Pennsylvania, Tennessee, Utah, British Columbia, and Nova Scotia. Since that time West Virginia has been added to the states in which examinations are given regularly.

Aside from the desire to pass the state examinations as a prerequisite to hold managerial positions, much good can be done the men in the coal-mining industry by giving them more specific knowledge of the dangers which are incident to mining and the way in which such dangers may be avoided. A better knowledge of the technology of mining will make not only for safety, but for lower costs of production and less waste in the amount of coal left in the ground, which now amounts to at least 50 per cent. of the coal in the bed.

The recent activities in connection with mining education of the Federal Board of Vocational Education and the United States Bureau of Education suggest the timeliness of a consideration of mining education in some detail. The two federal agencies mentioned, acting in co-operation with local representatives of the mining industry in Pittsburgh, Pennsylvania and Cumberland, Md., have recently held conferences in these cities to discuss the application of the Smith-Hughes act to mining conditions, and also the general educational and sociological conditions in mining communities.

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Three similar conferences are planned to be held in Illinois in the near future to cover the same topics. Although interest is thus shown to exist, conversations with mining men in a number of centers have shown a hazy knowledge of the Smith-Hughes act and the work of the Vocational Education Board. The following synopsis of that act is therefore offered in an effort to bring before the mining industry the salient features of the act applicable to mining education.

The Smith-Hughes act was passed by the National Congress, approved by the President Feb. 23, 1917, and amended slightly Oct. 6, 1917. Since these dates a considerable amount of instructive work has been done along agricultural educational lines, but much less progress has been made in industrial and trade lines. These latter phases of the work have not received the same attention as have the agricultural phases. This is due probably in great part to the better organization of the agricultural interests for carrying on propaganda; also to the fact that during the war period educational and sociological matters have necessarily been kept in the background insofar as they affected manufacturing and other industrial pursuits.

A number of questions have been asked in connection with the Smith-Hughes act; first:

What is the purpose of the Smith-Hughes Act? This is probably best expressed in the title to the act, which describes it as "an act to provide for the promotion of vocational education; to provide for co-operation with the states in the promotion of such education in agriculture and the trades and industries; to provide for co-operation with the states in the preparation of teachers of vocational subjects; and to appropriate money and regulate its expenditure."

DETAILS OF ACT ADMINISTRATION

How is the act administered? The administration of the act is vested in the Federal Board for Vocational Education, which consists of the Secretaries of Agriculture, Commerce and Labor, the United States Commissioner of Education, and three citizens of the United States appointed by the President by and with the advice and consent of the Senate. The civilian members of the board only receive salaries of $5000 each. The duties of this Federal board are: (1) To co-operate with state boards of vocational education. (2) To make or have made studies, investigations and reports that will be helpful in establishing and carrying on vocational schools and classes. (3) To co-operate with the Departments of Agriculture, Labor, Commerce and the Bureau of Education in making such studies and investigations as are outlined in (2).

How is the work financed? To provide for the administrative expenses of the Federal board an appropriation of $200,000 per annum is made. For co-operation with the several states, appropriations have been provided by the Federal Congress as follows:

Ending	Industrial Subject*	Fiscal Year	Trade, Home Economics and
June 30, 1918.....	$ 500,000	June 30, 1923.....	1,750,000
June 30, 1919.....	750,000	June 30, 1924.....	2,000,000
June 30, 1920.....	1,000,000	June 30, 1925.....	2,500,000
June 30, 1921.....	1,250,000	June 30, 1926.....	3,000,000
June 30, 1922.....	1,500,000		
Annually thereafter.	3,000,000		

*Annual appropriations are made for agriculture.
In 1918, $500,000; 1919, $700,000; 1920, $900,000; 1921, $1,000,000.

Of these amounts not more than 20 per cent. shall be paid for the salaries of teachers of home economics, leaving 80 per cent. for trade and industrial teachers.

How are these appropriations allotted among the states? The allotments to each state for trade and home economics instruction is based on the proportion between the urban population and the total urban population of the United States, according to the last census, not including the outlying possessions.

Although not so stated in the law, the definitions of urban and rural given in the census publications will presumably hold—namely, urban applies to cities and incorporated places of 2500 people and over, including similar unincorporated towns in New England. Rural presumably applies to towns under similar conditions of less than 2500 population, and to persons not resident in towns.

In addition to the foregoing amounts, for purposes of co-operation with the states in the training of teachers, supervisors and directors of agricultural subjects and teachers of trade and industrial and home economics subjects, the following appropriations have been made, to be allotted to the several states in the proportion that the population of any state bears to the total population of the United States, not including outlying possessions: In 1918, $500,000; 1919, $700,000; 1920, $900,000; 1921, $1,000,000.

The state treasurer shall be the custodian of the federal funds. The question is asked:

How can a state secure its portion of the Federal appropriations? (1) The legislature must accept the provisions of the Smith-Hughes act. (2) It must create or designate a state board of not less than three members with power to co-operate with the Federal Board for Vocational Education in administering the act. (3) The state vocational board must prepare plans showing the kinds of vocational education for which it is proposed to use the appropriation from the Federal Government; the kinds of schools and equipment; courses of study; methods of instruction; qualifications of teachers; and in case of agricultural subjects, the qualifications of supervisors or directors; plans for the training of teachers; and in case of agricultural subjects, plans for the supervision of agricultural education. These plans must be submitted by the state board to the Federal Board for Vocational Education for approval if they conform with the provisions and purposes of the Smith-Hughes act.

APPORTIONMENT OF THE APPROPRIATIONS

How may the state boards use these Federal appropriations? The appropriation for salaries of teachers of trade, home economics and industrial subjects shall be devoted exclusively to payment of salaries of teachers having the qualifications set up by the state board and approved by the Federal board. Every dollar appropriated by the United States shall be equaled by a like appropriation from the state or from the local community in which the instruction is given, and all costs for equipment and instruction other than salaries shall be met from the state or community funds. The total amount expended in any school or class receiving the benefit of the Federal appropriation shall be not less annually than the amount fixed by the state board with the approval of the Federal board at the minimum for such schools or classes in the state.

What shall be the character of the instruction given? To receive Federal money the instruction given must be: (1) In schools or classes under public supervision or control. (2) The controlling purpose of such education shall be to fit for useful employment. (3) Such education shall be of less than college grade and designed to meet the needs of persons over 14 years of age who are: (a) Preparing for a trade or industrial pursuit (full-time schools); (b) for those who have entered upon a trade or industrial pursuit (part-time schools and night classes).

Continuing as to the character of the instruction given under full-time schools: (4) If such schools or classes give instruction to persons who have not entered upon employment, they shall require that at least half the time of such instruction be given to practical work on a useful or productive basis, such instruction to extend over not less than nine months per year and not less than 30 hours per week. For cities and towns

*A state may accept the benefit of any one or more of the funds now appropriated as noted above, but after June 30, 1920, no state can receive any appropriation for salaries, unless it has received meanwhile at least a minimum amount appropriated for teacher training.

of less than 25,000 population, the state board with the approval of the Federal board may modify the conditions as to length of course and hours of instruction per week for schools and classes giving instruction to those who have not entered employment in order to meet the particular needs of such cities and towns.

In connection with part-time schools: (5) At least one-third of the sum appropriated to any state for the salaries of teachers of trade, home economics and industrial subjects shall, if expended, be applied to part-time schools or classes for workers over 14 years of age, who have entered upon employment. (6) The subjects taught in a part-time school or class may be any subject given to enlarge the civic or vocational intelligence of workers over 14 and less than 18 years of age. (7) Part-time schools or classes shall provide for not less than 144 hours of classroom instruction per year.

Finally, under evening schools: (8) Evening industrial schools shall fix the age of 16 years as a minimum entrance requirement and shall confine instruction to that which is supplemental to the daily employment.

How are vocational teachers trained? The teacher of any trade or industrial subject in any state shall have at least the minimum qualifications for teachers of such subjects determined upon for each state by the state board with the approval of the Federal board. For a state to secure Federal money for the training of teachers, such training must be carried on: (1) Under the supervision of the state board; (2) in schools or classes under pubilc supervision or control; (3) training shall be given only to persons who have had adequate vocational experience or contact in the line of work for which they are preparing themselves as teachers, supervisors, or directors, or who are acquiring such experience or contact as a part of their training; (4) the state board with the approval of the Federal board shall establish minimum requirements for such experience or contact of teacher; (5) not more than 60 per cent. or less than 20 per cent. of the money appropriated under the Smith-Hughes act for the training of vocational teachers shall be expended for any one of the following classes of teachers: teachers, supervisors or directors of agricultural subjects, trade and industrial subjects, and home economics subjects.

The Coal Shortage in Europe

By DR. PAUL BARTHOLOW
New York City

It is a truth universally discussed in Europe that upon the supply of coal depend the reconstruction of states, agriculture trade, railway transport and manufacture of all kinds. The truth indeed seems obvious enough, but the far-reaching consequences of a coal famine are difficult to grasp except by careful study of the conditions where it actually exists. In an article upon this subject in the *Journal de la Foire de Lyon* of September 27th, an account is given of the coal crisis in one of the new states, Czecho-Slovakia, with consequences that astound the reader and in many ways show some of the difficulties of President Wilson's program. As a means of promoting trade and peace there is now no more powerful instrument than a free distribution of fuel, whether coal, wood, lignite, pulverized coal, artificial coal, and electricity. The *Journal* says:

"The coal crisis is general throughout the world, but in Central Europe its reciprocal effects or repercussion are much more serious because they are accompanied by two crises: that of revictualing and that of transport. The principal source of the coal for Central Europe is the basin of Upper Silesia which before the war exported two-thirds of its production (43,000,000 tons) to Czecho-Slovakia, Poland, and Austria. The production from this basin has now dropped to 2,000,000 tons a month, scarcely enough for the pre-war supply of Austria alone. Before 1914 Czecho-Slovakia also exported some of its coal, but these exports were only possible on condition that coal and coke from Upper Silesia and Westphalia were imported for the needs of its industry. At present the production from Czecho-Slovakia must be requisitioned, not only for its proper requirements but also for those of Austria. Before the war Austria imported from Germany 13,000,000 tons of coal, 9,000,000 tons of coke, 1,500,000 tons of lignite. These quantities were for the most part destined for Czecho-Slovakia."

As a country, Czecho-Slovakia has no such requirements as other more largely industrial states. It is a country half-agricultural, half-industrial. But since it depends chiefly on agricultural products, it happens that it is in autumn that industrial work is the most intense. The sugar refineries, steam mills and other factories for the utilization of products from the soil begin their chief activity after harvest. Similarly, the manufacturers of machinery resume their output in order to furnish agricultural implements for the farmer, while there is a greater demand for the construction of locomotives, and rolling stock. All this necessarily depends upon coal.

It is not a matter of very great difficulty to find other explanations of the effect of coal shortage not only on industry but on the health and morale of nations. The disasters involved come suddenly and, as a German writer observes, produce a state of mind which is hardly sane. The matter would seem to be thus—that while the effect of a coal shortage on industry may be obvious after a little reflection, it is not so well understood how cold and hunger, its other consequences, affect the health and spirits of nations and reduce their energy and powers of work. "The diminution of production," according to the *Holz Zeitung*, "is accentuated steadily, because the distribution of coal is made with less method and because men work less. The gravest problem now, and will be, is the lack of coal. The mills must shut down longer than the work permits; what is worse, no one knows when the furnaces may be relighted. All calculations and all the measures taken lead to nothing. The result is that production is reduced to the lowest point, and remains far below requirements. Again, idleness, which rules, also contributes to the diminution of production." Hence it is not surprising to read that although reserves of coal have increased in Rhenish Westphalia, improvement of industry and distribution have not been observed.

It is suggested that coal be pulverized, so that each particle is burnt and in burning unites with the greatest amount of oxygen giving the greatest amount of heat. The waste of steam and of heated exhaust gases is also condemned, while it is also suggested that a force of experts be appointed to factories and furnaces to inspect the washing and analysis of coal.

Meanwhile Europe is seething with a spirit of rebellion over the coal shortage. France, for example, produces 25,000,000 tons less than her requirements, and she must now provision Alsace-Lorraine. Thus coal has a political as well as an economic significance. "The results of a continued shortage," says a French journal, "will be regrettable and may lead to further outbreaks of war."

New Coal Loading Machine at Montour No. 10 Mine of Pittsburgh Coal Company

By R. W. MAYER
California, Penn.

THE Montour No. 10 plant, which will be the largest producer of the Pittsburgh Coal Co.'s mines, is located between Library and Finleyville, in Pennsylvania. The Pittsburgh Railways Co. (Charleroi Division) gives a half-hourly service on its trolley line which passes the mine, Coal Bank being the stop at the tipple. Freight for the plant is hauled over the Montour Railroad.

The coal mined here is the Pittsburgh thin seam, which lies considerably above the bottom of the valley. A tipple and approaches, nearing completion, are being built to span the valley, some coal having been dumped from it already; it crosses the Montour Railroad, a street-car line, public road and a creek. There is a steel span over the street-car track; but the rest of the tipple is constructed of wood as the cost of steel was considered prohibitive. The timbers on the tipple and trestles were painted with Carbolineum, which adds considerably to the life of the structure. The Pittsburgh company has used this wood preservative before, and it has proved quite satisfactory. Reference is made to this matter in an article entitled, "Montour No. 8 Plant of the Pittsburgh Coal Co., in the Mar. 30, 1918, issue of "Coal Age".

There are two dumps on the Montour No. 10 tipple, the coal being delivered to the tipple from both sides of the valley; however, each dump handles the coal from one side only. The tipple is designed for an output of 5000 tons per day, but one cross-over dump is capable of handling more than half of this amount under favorable conditions.

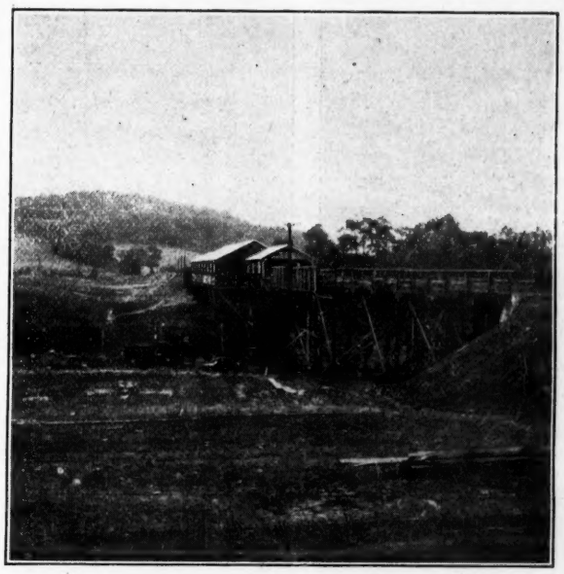

FIG. 1. THE MONTOUR NO. 10 TIPPLE

The coal will be delivered to the tipple from four openings on one side of the valley; no rooms have been turned off these entries as yet, development work only being done. The entries extend toward Bridgeville, where the company has other operations. The coal obtained from this development work has been dumped in a small valley and stocked, the tracks running directly from the mine on a level out over the dump.

The tipple is also suppiled with coal from the opposite side of the valley, as stated. This opening extends for about five miles underground, connecting with the Lick Run mine, owned by the same company. About three miles of this entry is through solid coal, no rooms being turned. All the coal from this development work was also stocked, but on the side of the valley nearest the opening. A short entry was driven from this main haulage road to a side valley on which the seam outcropped. This entry followed the coal seam until the outcrop struck the bottom of the valley, which was quite narrow. A hoist pulled the cars up an incline on the opposite side of the valley.

The coal from preliminary operations of development work was dumped from tracks running out over the brow of the hill, a simple but effective kick-back dump being used for this purpose. This dump was constructed by mounting on four car wheels (C, Fig. 2). The front of this platform was cut beveled and shortened at the top. Another platform carrying the dump was hinged on top of the bottom one and carried the track rails for the car to run upon. A flat piece of ½x4-in. iron was fastened to the side of the bottom platform and passed through a loose guide on the side of the dump, to give greater steadiness to the platform when dumping.

The car-dumping outfit runs on a track which is extended as the dump advances. Track rails run from the top of the dump car to the track on which the dump car travels; the ends of these rails are beveled to a point and project down over the track rails. The loaded car of coal thus can be run right up to the top of the dump car, from which the coal is discharged. This method practically does away with the work of leveling off the bank for the next length of rails.

About 30,000 tons of coal are stacked in one pile from the single mine opening, and at least one-third as much more is stacked on the other side of the tipple from the four mine openings on the other side of the valley.

The Joy Loading Machine Co., of Pittsburgh, Penn., has a machine at work on the stock-piles loading the coal into mine cars at the Montour No. 10 plant. The coal is then dumped on the tipple and loaded into railroad cars. The Joy company has two other machines of the same type at work at the Belle Vernon mine of the Pittsburgh Coal Co. The loading machine weighs between six and eight tons and stands 5 ft. high; however, it can be lowered to 4½ ft. in height by an adjustment on the hopper. At present the Joy company is testing this machine to learn whether it can be improved in any way.

The Joy loading machine (*D*, *E* and *F*, Fig. 2) is mounted on a truck so that it may run on track. A conveyor carries the coal from the level of the ground, at the base of the coal pile, to a circular hopper into which it discharges it. This hopper holds about three tons. Another conveyor takes the coal from the bottom of this hopper, elevates it to a point over a mine car, and discharges it into the car. The car-loading conveyor is shown in the background and to the right of *F*, Fig 2. The mine cars are shifted back and forth to the loader as required.

The distinguishing feature of the Joy loader is the method used to get the coal on to the conveyor from the pile. The flight conveyor is of regulation construction with iron slats attached to endless chains. This conveyor is shown in the

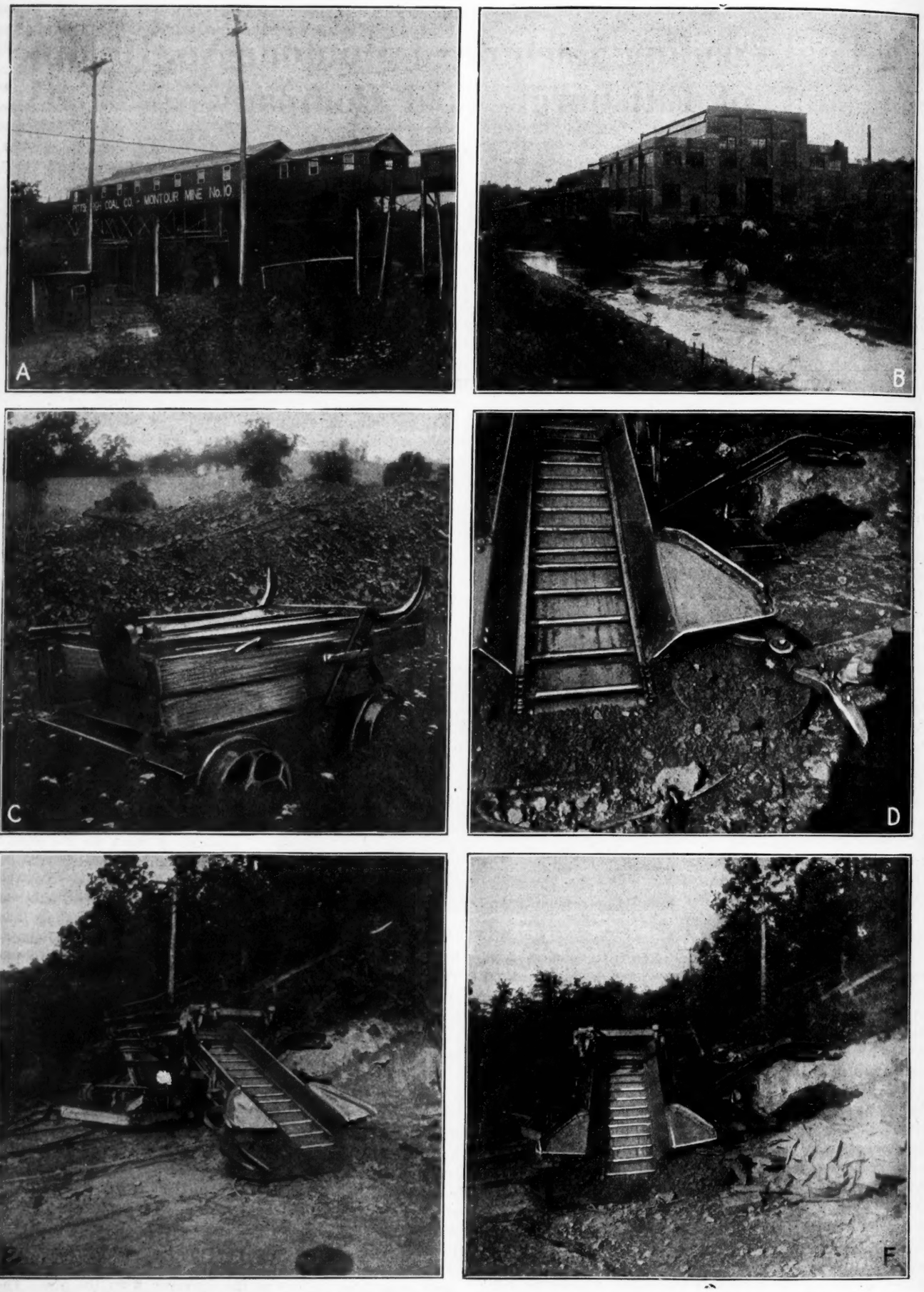

FIG. 2. VIEWS OF THE PLANT BUILDINGS OF THE MONTOUR NO. 10 MINE. THE LOADING MACHINE.
A—The Tipple. B—New Office and Shop. C—Kick-Back Dump. D, E, F—Views of Loading Machine.

foreground of *D*, *E* and *F*, Fig. 2. The end of this conveyor is made wedge-shaped so that it will enter the coal pile. As the conveyor is shoved into the pile, the coal falls down upon the belt and is carried up to the hopper.

Special provision is made to handle compact piles or large pieces of coal. At the bottom end of the conveyor (on each side) there is an arm whose motion is much the same as that of a person shoving both arms into the coal pile, then curving the arms toward each other and scraping or pulling the coal back on to the belt of the conveyor. These arms can be made to dig into the bottom, or at any part of the pile, by raising or lowering the conveyor. The conveyor not only can be raised and lowered, but it can be swung through an arc of 180 deg. This machine is supposed to do all the loading from the track and not be taken from the rails.

DETAILS OF FEED ARMS

The arms feeding the coal to the conveyor are made from 3-in. bar steel. The part which enters the pile has spurs, or spikes, on its upper side to help loosen and scrape the coal toward the belt. The spurs are about 4 in. long.

The arm is L-shaped and is pivoted at the angle of the L to a revolving eccentric. The arm of the L which has the spurs is forced into the pile of coal. The other arm of the L is hinged to a traveling rod which slides back and forth in guides. The rod which enters the coal has a slight curve to it and is about 2 ft. long. This mechanism gives the spurred arm a straight-ahead endwise movement, changes it to a sidewise swinging movement and then to a sidewise backward movement; this loosens the coal and scrapes it on to the belt. The ends of the two arms meet in their backward movement.

The Joy loading machine is run with General Electric motors, and the inventor claims a capacity of 200 tons a day when loading coal in a mine. Loading from a stock pile on the surface, its capacity should be much greater when everything runs smoothly.

The Lick Run mine is on the Baltimore & Ohio Railroad, and its output has been shipped over that line. It will now be run over the Montour No. 10 tipple and be shipped by the Montour Railroad, with which the Pittsburgh Coal Co. is closely affiliated. All haulage is by electric motors, mostly of the Jeffrey make. Morgan-Gardner machines are used to undercut the coal. The mine cars hold about three tons. The rails used on the main haulage roads are of 60-lb. steel; 40-lb. steel is used on the entries and 25-lb. steel in the rooms.

IRON PIPE FOR SUSTAINING TROLLEY WIRE

The frame for carrying the trolley wire on the approach to the tipple is made from 2-in. iron pipe. Wide bases having a socket are fastened to the floor planks, and the upright pipes set in these sockets are held with a set screw. The electric power used at this plant has been taken from the Pittsburgh Railways Co., but this will be changed in the near future.

The opening from the Montour No. 10 tipple runs to the Lick Run mine, as stated, and a person can travel underground from there to Keeling shaft, through coal all the way, to the incline at 12th Street, South Side, Pittsburgh.

A large office building and machine shop is being built at the Montour No. 10 mine, constructed of brick, concrete and steel (*B*, Fig. 2). A corridor separates the office portion of this building from the machine shop, thus making a more or less soundproof partition. This building will serve as headquarters for a number of the Pittsburgh Co.'s mines in this section. A town for the accommodation of the employees of this plant has not been built as yet.

Americanization Work in the Mining Towns

Though the war interfered to a large extent with the educational work carried on by the anthracite mining companies, and in some cases the suspended night classes have not been resumed, the increased interest shown in such classes as have been called together again is such as to indicate even better results than have hitherto been reached. This is particularly true of the "Americanization" classes wherein foreign-born mine workers are drilled in those branches which will give them the knowledge needed by an American citizen and enable them to pass naturalization examinations.

The Lehigh Coal and Navigation Co. is doing an effective work in this direction. This company's night classes, held in the Lansford High School three nights a week, had an average attendance of 192 pupils in October. All are employees of the company; none is under 17 years old, and there are instances of pupils as old as 42 years; and a large percentage are married men.

The beneficial results of this night school work in the Panther Creek Valley can hardly be estimated accurately, but one aspect of it is clearly shown by the attitude of the wives of the Slav miners. Their children are of course being educated as Americans in the public and parochial schools, the foreign clergy in that neighborhood being pronounced in their stand for Americanism. Now their husbands are being moulded into Americans by the night schools and are taking the first steps toward becoming real American citizens. In other words, their husbands and families are growing beyond them.

The Kingston Coal Co. is also doing Americanization work among miners and their famililes in the Kingston neighborhood. For about fifteen years this company has maintained its library for employes, and they have also maintained a night school for employes in the library building. This school is in operation this year with an added course, electricity. The Y. M. C. A. co-operates in this work by supplying instructors when needed.

In its general interest in citizenship and civic improvement work, the Kingston Coal Co. has taken up the policy of starting early with the alien. To this end it is the main co-operator in the Kingston kindergarten, which is under the general supervision of the Kindergarten Association of Wilkes-Barre. The association supplies a teacher and some of the supplies, while the coal company furnishes the building and acts as general booster and man of all work.

A CALENDAR INNOVATION

The company is also at work on its 1920 calendar, which is an institution of standing in the Wyoming valley. Instead of merely posting abstracts of the mine law, as required by statute, the company prints these digests on a calendar. The calendar itself is embellished with good engravings of improvements about the mines, of new buildings in the various towns, of churches and public works in which the miners, the company, or both, may have a direct interest. The idea is to have a man, every time he looks at the calendar to mark down his days worked, his cars loaded or any other memoranda, to see some part of the mine law before him, and to see a graphic reminder of what his working place, his community, or his church means to him and to all his fellow workers. So popular have these calendars become that the demand comes not only from men in the mines, but from their families and from other families throughout a wide area.

Miners and Operators Seek End to Strike Negotiations

WHILE there has been some difference of opinion among officials in Washington as to what constitutes a reasonable wage for coal miners and a reasonable profit for operators, there has been a very general desire throughout the entire strike negotiations for a showdown. The labor situation throughout the country has become such that certain precedents had to be established, and it is belived that out of the present struggle a procedure is certain to be developed which will make possible greater safeguarding of the public and at the same time will not give either capital or labor undue advantage over the other.

That the coal strike has destroyed much of the prestige with Congress which had been enjoyed by labor, is admitted generally. It is practically certain that legislation will be enacted at the present session which will place some bridle on the strike.

There are some who expect to see the strike bring about Government operation and control of coal mines for an indefinite period. Others, however, are convinced that the Government will avoid such a step to the last. Government operation would not in any way remove the danger of a strike, it is pointed out, and is certain to result in greatly increased cost of coal to the consumers.

INJUNCTION NOT EFFECTIVE

Many officials in Washington are of the opinion that the use of the injunction was a mistake. The practical effect of the injunction was of little value in that few of the striking miners returned to work. Had the Government been more active in providing protection for the men who desired to work, it is believed that the output of coal would have been much greater during the entire period of the strike.

Washington has been the scene of many of the more interesting phases of the most notable clash between capital and labor. Senator Frelinghuysen's investigation into the coal situation brought out many points which tended to clarify the minds of members of Congress as to the intricate situation existing within the coal industry. This was followed by the two dramatic speeches of Senator Frelinghuysen in which he told the Senate that the United Mine Workers of America were using their power in an autocratic and in ar entirely indefensible way. There have been few times in the history of the Senate when a body of citizenry—particularly one having so many votes—has been so thoroughly grilled.

When President Wilson's appeal for the suspension of the strike, pending further conferences, was rejected by the miners, Dr. Garfield was called to Washington and since that time has been the dominant figure in the coal situation. Unprejudiced observers are a unit in their conclusion that Dr. Garfield has displayed such ability in the handling of this situation as clearly to class him as one of the most able men in the country. Even the representatives of the miners are willing to admit that he is a man of great caliber. After the notable conference in the Red Cross Building, at which Dr. Garfield made his 14 per cent. announcement, representatives of the miners were indignant with themselves that they had not retired from the hall immediately. The more questions they asked him, and the more they argued with him, the "deeper in the hole" they got, to use the expression of one of the labor leaders.

The Central Coal Committee, which is looking after distribution, is essentially a railroad organization. There are two exceptions. C. E. Lesher, one of its members, is the geologist in charge of coal statistics for the United States Geological Survey, while H. Y. Saint is in charge of the coal division of the Shipping Board. Due to the fact that the Fuel Administration had no funds, it was not possible for it to set up its own distribution division.

PRAISE FOR REGIONAL COMMITTEES

It is admitted on all sides that the Central Coal Committee, with its regional committees, has done very effective and efficient work. This Committee is looking at the distribution problem as if the coal fields of the country were a doughnut. The central competitive field is the hole in the doughnut, while the rim contains the fields which are producing coal. Its problem is to get the coal, produced in the rim of the doughnut, into the hole. That this is a problem of magnitude may be seen from the fact that during the first four weeks of the strike, the coal produced in the Central Competiive Field was less than one per cent. of normal.

At this writing, the Central Coal Committee is on the point of taking steps to regulate the making of coke. Under present conditions, with a limitation on the price of coal and none on coke, an abnormal percentage of the coal in the Connelsville region is going into coke.

The most serious problem that the Central Coal Committee is facing at this time is the securing of payment for coal which has been diverted. While theoretically there should be no great delay in getting the money for the coal back to the operator, under the present system, it does not work out in practice. When coal is diverged, the consignee is required to put up collateral for payment. The probabilities are, however, that he never has heard of the consignor and, as often is the case, there may be delay in his learning who is to receive payment for coal. While ultimate payment is safeguarded, most shippers find that they have received but a small proportion of the amount due since the railroads began diverting the coal.

Fuel Inspection System Sought

An appropriation of $725,000 has been asked by the Secretary of the Interior for the establishment of a fuel inspection system. The work in this connection, should Congress approve, would be done by the Bureau of Mines. The request of the Secretary of the Interior specifies that a chief coal inspector is to be employed at a salary of $5,000; and assistant chief coal inspector at $4,000; six district coal inspectors at

$4,000, and 100 field coal inspectors at $2400. In justifying his request for the appropriation, Secretary Lane says:

"Inspection, sampling analysis, and certification of coal should be made by the government. This practice is followed in other commodities and would be a benefit to the producers of clean coal, the consumers, and to the interest of foreign commerce. This will assure the consumer the grade of coal which he pays for, protect the interest of those preparing clean coal, without discouraging the mining of poorer grades of coal and should exert an influence toward good preparation.

"This coal inspection system proposed by the Bureau of Mines contemplates as a salient feature advice as to the quality of coal shipped. It is proposed that each mining company set its own standard of quality, consistent with the particular vein preparation, and the market which the business affords, and that the government shall publish such standard and certify as to whether such standard is being maintained by the mining companies. There is not contemplated a certification as to each and every shipment, but the system does provide for the accurate sampling of full carload lots and for the inspection and sampling at irregular intervals of a sufficient number of cars of coal to indicate whether the declared standard of the mining company is being maintained. The coal mining companies would co-operate and enter the system and be privileged to advertise that their product was from a mine whose standard or preparation was certified by the government. In case the coal shipment was below the standard, the mine owner would be promptly advised of the fact, and, where possible, the consumer would receive a notice to the same effect. If the coal continues to fall below the standard, it would be removed from the certified list established by the government and the mine would be required to declare a new and different standard which its product could meet.

Aeroplanes for Mine Rescue Work

Plans looking to the use of the aeroplane in mine rescue work are being made by Director Manning of the Bureau of Mines and by General Menoher, Director of the Air Service of the Army. By transporting an engineer skilled in mine rescue work with as many sets of breathing apparatus as can be carried, it is expected to save much valuable time in case of a mine disaster. At first the Bureau of Mines district engineers will have to rely upon securing an aeroplane from the nearest aviation field. It is hoped ultimately, however, to have planes held in readiness for such work at each district headquarters.

Steps now are being taken to prepare landing fields at the mines. It is believed that the mine companies will be willing to arrange these fields. A landing field requires a fairly level runway of 1800 feet in two directions. While it is realized that it will be impossible in many instances to provide such a field right at the mine, there will be few cases where it will be impossible to provide the necessary runways in the general vicinity, from which automobile transport could be used to complete the journey.

Due to the fact that such a large percentage of mines are located in mountainous areas, much time is lost in reaching a mine after a disaster unless it happens that prompt railroad service is available. In a great majority of cases it is necessary to use automobiles to get breathing apparatus and experienced rescuers to the scene of the disaster. In many cases the wagon road is circuitous. The greatest saving of time could be effected in many cases where it is possible to take the direct air line at the rate of 100 or more miles per hour. Such aeroplanes as are available for this service at present would carry the pilot, the engineer, and 8 sets of breathing apparatus.

The idea for utilizing aeroplanes in mine rescue work came from F. J. Bailey, the Assistant to the Director of the Bureau of Mines, who among his other duties, is in charge of mine rescue stations. He conducted the negotiations, which resulted in General Menoher's pledge to co-oprate actively in this work.

Railroad Administration Providing Adequate Transportation

Criticism of the transportation furnished by the Railroad Administration caused Walker D. Hines, Director General of Railroads on Oct. 29, to issue the following statement as to the achievements of the administration during the period when operators were in sore need and hindered by other troubles:

During the first six months of this year an abnormally small amount of bituminous coal had been mined and transported because of the lack of demand. The demand began to improve in June and July. Slight car shortages for the movement of bituminous coal began to become evident in June, and became more pronounced about July 15. In a statement sent to the Senate under date of Aug. 14, in response to a Senate Resolution, I said that I did not anticipate any shortages in transportation which would be in any sense exceptional or abnormal or which would justify oppressive prices for coal. On Sept. 4 I appeared before a sub-committee of the Interstate Commerce Committee of the Senate investigating the coal problem and stated that the Railroad Administration would be able to transport the necessary coal and that the Railroad Administration proposed to adopt whatever expedients were necessary to accomplish that purpose. I called attention to the fact that while the highest production that had ever been made in a week was 13,000,000 tons, the highest that had been averaged for any considerable period of weeks was something over 11,000,000 tons.

Up to September not exceeding 10,000,000 tons of bituminous coal had been transported per week. The Railroad Administration early in September instructed that the Railroads endeavor to provide transportation for 11,000,000 tons per week. The result has been as follows:

WEEK ENDED	
September 13	11,046,000 tons
September 20	11,253,000 tons
September 27	11,613,000 tons
October 4	11,518,000 tons
October 11	11,881,000 tons
October 18 (estimated)	11,784,000 tons
October 25 (estimated)	12,900,000 tons

On Thursday, Oct. 16, or two weeks ago, I had a meeting with the Regional Directors covering the western territory, and the same day the coal situation was taken up with the Regional Directors of the territory in the east and south, and as a result instructions were immediately issued under which railroads serving coal mines were to make preferential efforts to furnish mines with empty coal cars up to the ability of the mines to load daily, and non-coal loading railroads should commence immediately to deliver daily to their nearest coal loading or coal route connections empty coal cars up to the maximum ability of such connections to receive such cars. Instructions were also issued the same day to the effect that open top cars should be immediately withdrawn from non-coal service in numbers sufficient to permit placement at mines and deliveries to coal loading connections as required; also that consignees not unloading coal within twenty-four hours after cars were placed for unloading should have no additional cars placed for unloading.

The result of these arrangements is indicated by the estimated increased production for the week ending Oct. 25. The indications are that the production and transportation will be at not less than a corresponding rate during the present week.

Miners Receive 14 Per Cent. Increase

In a message prepared on Nov. 28 by the committee of coal operators consisting of T. W. Guthrie, A. M. Ogle, Thos. K. Maher and E. C. Teals, who remained in Washington to represent the Central Competitive Field, the committee notified the operators to post the following notice of increase in wages as ordered by the Government:

The Government of the United States having decided that mine workers are entitled to a 14 per cent average increase to bring wages up to the increased cost of living, this company gives notice that a 14 per cent average increase in wages is hereby granted, effective at once. This average increase will be so divided as to preserve present differentials. No change will be made in conditions of employment. The new scale of wages will be posted as soon as possible.

Coal Strike to be Probed by Senate Committee

An investigation of the coal strike along the lines of the probe into the steel strike by the Senate has been requested by Senator Jones of Washington. It is his plan to have the investigation undertaken by theCommittee on Education and Labor, of which Senator Kenyon of Iowa is the Chairman. It is the intention to take the testimony, not only of the more important figures on each side of the coal controversy, but also the district officers of the unions; individual workers, and individual operators.

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With Your Kind Permission

THIS issue the reader will note is an amalgamation of two issues, Nov. 27 and Dec. 4. Only by joining issues together is it possible for us promptly to get back to our regular schedules after the long strike of the printing unions of New York City. We are including in this issue the accounts of the meetings of the West Virginia Mining Institute and the Coal Mining Institute of America, both of which took place recently and in which much information of interest to all mining men is contained.

We expect by Dec. 25 to be once more on our regular schedule and to be able to produce a paper containing all the departments we were running before the strike made the publication of the paper difficult.

Our reading public has borne patiently with us, just as the consuming public has endured with forbearance the long coal strike. Our readers knew we were willing to deal fairly with our men; that we had met them and made them a fair proffer (one acceptable to, and accepted by their international officers) and our readers stood by us from the very first to the very end.

The general public also know that the bituminous coal operators were willing to concede all that the Government ordered, even when in their hearts they questioned the fairness of the order and the advisability of it. In consequence the nation, prone to be unjust when annoyed and little disposed to consult with its reason when its interests are invaded, showed a sympathy, an insight and a patience that was surprising to those who confidently expected that the people would be governed by spleen and not by calm counsel.

By reason of the collapse of the strikes—those of the steel workers, the mine workers and the printing craftsmen—the strike mania is on the decline. Nothing could be better for the workingman. He cannot afford to pay these classes of workers what they asked for their services, and he cannot face with composure the continued loss of production and the increasing cost of output resulting from such disturbances.

In Russia the men work about three hours a day and spend the rest of the time hunting in vain for the food, clothing and comforts that they could easily produce in the other five hours if they would only work—and they cannot find them for they have not been produced. The Russian socialists have so successfully obtained concessions for the workingman that now he cannot afford to buy himself even a coffin.

Electric Mine Lighting

WE PRINT upon page 849 of this issue, a short description of electric lighting at the working face of the mine. This method of illumination has been in use long enough to have passed the experimental stage. In the mines described it has become an accomplished fact the utility of which is well recognized.

Sight, of course, depends upon light, in most instances reflected light. The interior of a coal mine has always been difficult of illumination because the black, or nearly black, surfaces of ribs, roof and floor reflected but little of the light striking them. The ordinary cap lamp was therefore apparently much less effective underground than it was in, we will say, the interior of a building with white walls and ceiling.

Uncertain or inadequate lighting is a potent factor tending toward accident. The employment of electric bulbs at the working face, through their much better illumination of coal and roof conditions, beyond the shadow of a doubt are a powerful influence tending to neutralize or offset the most prolific cause of accident encountered in American coal mines. This fact alone, regardless of the increased efficiency of the miner which they render possible, might in many instances be sufficient justification for their installation.

Another Factor of Education

THE great college professor strolled down the platform a few minutes before train time. Down at the head of the train he paused to watch the engineer oiling up his locomotive. For some time he watched this overalled engine driver unobserved. When the engineer finally looked up each recognized in the other a companion of earlier days. They had been boys together, their father's owning and working adjoining farms.

The men sprung forward and clasped hands. After a few casual remarks the engineer inquired if the professor (only he called him Bill) was going "down the line" and upon receiving an affirmative reply he invited the great educator to ride in the cab with him. And partly for the novelty of the experience and partly that he might see his old playmate "in action" the professor accepted the invitation.

After the run was over the professor went with the engineer when he made his report and modestly entered his train as "on time." In parting the professor pushed an admission ticket into his friends hand explaining that he was scheduled to deliver a lecture that night on education and he would be glad to have the engineer attend and give him his honest opinion of his views and treatment of the subject.

All through the lecture the engineer listened attentively. He was not however enthusiastic and sometimes gravely shook his head when others applauded. When the meeting was over he came to the professor and said: "Bill that certainly was a fine talk you made but to my notion you completely missed the backbone of the whole subject. To my way of thinking the really educated man, the man whose learning is of real value is the one who is onto his job. The education that don't make a person more efficient in the position he fills is not worth getting."

And the great professor, remembering his ride of the night before, was compelled to admit the truth of the engineer's assertion.

When will those who seek to improve and develop the minds and intellects of our mining folk, educate their pupils into instead of out of their positions in the mines? When will the night schools conducted in various mining communities seek to develop not mediocre foremen but efficient miners, and drivers and machine men? In short when will the course of study pursued tend to put a man onto his job?

DISCUSSION *by* READERS

EDITED BY JAMES T. BEARD

The Miners' "Keg Fund"

Letter No. 1—Believing that it may be of interest to many old timers in the anthracite region, particularly employees of the Delaware, Lackawanna and Western R. R. Co., allow me to use the columns of COAL AGE to refer to the reported conversation between E. J. Lynett and the late John Mitchell, relating to mine accidents, as published in the Scranton Times, Sept. 25, 1919. In the article to which I refer, Mr. Lynett quotes Mr. Mitchell as expressing the opinion that 60 per cent. of the general mine accidents are due to the carelessness of miners and inadequate scientific supervision.

After commenting on Mr. Mitchell's ideas relating to the compensation of miners and mine laborers injured or killed in the pursuit of their calling, which were practically a forecast of the present Compensation Laws and, at that time, not then even thought of as a feasible project, Mr. Lynett refers to the efforts of coal miners to establish what became known as the "Keg Fund," designed for the benefit of injured miners and their dependents. Mr. Lynett states, "I cannot recall, at this moment, if the keg funds were then in existence; but, to the best of my recollection, they were not."

It is not my desire to take any exception to the statement attributed to Mr. Mitchell, regarding the responsibility for mine accidents, or to deprive him of any honor that is rightly his for having pioneered the Industrial Compensation Laws. I would, however, call Mr. Lynett's attention to the fact that, long before Mr. Mitchell came to the anthracite field, the so-called "Keg or Accidental Funds" were in a flourishing condition, at least at most of the coal mines of the Delaware, Lackawanna and Western R. R. Co.

It is a rather strange coincidence that this reference of Mr. Lynett to the "Keg Fund," together with the announcement coming at the same time of the death of the late Arthur H. Storrs, brings to my mind some of the early history of the establishing of the "Keg Fund," which I will recite briefly for the benefit of those interested.

It was in the early 80's, I do not just recall the year, that a committee of the Delaware, Lackawanna and Western R. R. Co.'s employees, representing the Bellevue, Dodge and Scranton mines, called on W. R. Storrs, the father of the late Arthur Storrs and, then, general coal agent for the company, and laid before him and the general inside superintendent, B. Hughes, the general plan of the miners' "Keg Fund," explaining its aim and object.

Both Messrs. Storrs and Hughes were favorably impressed with the proposition and suggested to the committee that the company would be willing, on their part, to take over all the empty powder kegs of the miners and supervise the fund at no expense to the men, applying it for the benefit of any employees who might be injured or killed in the mines, according to the plan contemplated by the proposed organization.

The committee reported back the results of this interview to a joint meeting of the men, with the result that a great deal of fear was felt and expressed that the officials had "something up their sleeve," as the saying goes. It was thereupon decided to refuse the offer of the company, the miners preferring to retain the management of their fund in their own hands and control.

An organization was soon formed, including the employees of the Bellevue and Dodge mines, which continued until September, 1887, when the Dodge men withdrew and formed another organization of their own, electing the following officers: John C. Lowelle, president; William T. Williams, vice-president; Edward James, treasurer; H. G. Davis, secretary.

The election of Edward James, who was foreman at the colliery, as treasurer of the fund, was only in keeping with the usual custom. Membership in the fund was voluntary and, while some of the employees did not look upon the fund with favor, the fact that the boss was treasurer exerted a strong influence to induce the indifferent ones to become members and contributors to the fund. I am advised that the Dodge fund is still in existence and is in a flourishing condition today.

Let me say, in closing, that the "Keg Fund" has proved a great blessing to many of the mine workers who were injured in the early days, and to the dependents and families of those who were killed. These early efforts of the miners, in their own behalf, have doubtless done much to advance the idea of compensation for injury and the enactment of such laws by different states. AJAX.

Kingston, Penn.

Problem in Coal Extraction

Letter No. 11— In the issue of COAL AGE, Aug. 7, p. 234, there appeared an article on the extraction of the coal from a seam 8 to 11 ft. in thickness and lying at a depth varying from 450 to 600 ft. Although not proposing to enter into a discussion of the method outlined in that article, as there are others more competent to do this than myself, I desire to suggest the trial of a longwall method of extraction that I will describe briefly as follows:

On a front varying from 500 to 1000 ft. the longer the better, start a longwall face, taking out from 3 to 4 ft. of the bottom coal and brushing sufficient roof coal on the road to maintain the desired headroom. Build and gob this coal on each side of the road, in the same manner as rock or slate brushing is built and gobbed, to form the main road. On a 1000-ft. front, there will be room for driving 33 places, on 30-ft. centers, extracting, say 3 ft. of the coal in driving up these places.

Taking out 3 ft. of the coal in the first operation, on a longwall face 1000 ft. in length will permit the top coal to settle gradually down to the pavement in the time that the face is advancing, say 50 yd. Props are set in rows along the coal and these are drawn and reset as the face advances. By a proper arrangement of the timbers, the pressure is kept uniform and the coal at no point is exposed to an excessive weight and crushed.

When the longwall face has advanced a sufficient distance, say 50 yd., the working places are cut off by a crossroad or entry. The distance between crossroads must be determined, by experiment, to suit the conditions. New roads are now branched off the crossroad, in the same manner as at first and driven forward another 50 yd.

By the time the first cross-entry has been driven 1000 ft., the top coal will have settled to the pavement over an area 150x1000 ft. Into this area, roads are now started backward in the top coal. The reason for working backward, or on the retreating plan, in the top coal is that there is now no material at hand for gobbing to keep the road open, so that the air will have a free passage along the face.

This plan of working out 3 ft. of bottom coal, first forward and then backward, between cross roads, can be applied successfully and continuously to seams of any thickness, say 20 or 30 ft. or more. When the places have been worked forward and backward once, this can be repeated again and again, as the coal above settles down to the pavement. The crossroads are worked backward in the same manner as the working places. I have simply outlined the method, which will be easily understood by those familiar with longwall work. The plan will prove successful on a grade up to 30 deg.

Cumberland, N. S. JOHN McNEILL.

Bolshevism in America

Letter No. 8— Whatever may have been the original idea or theory of Bolshevism, its practice has degenerated today into a form or principle that does not appeal to rational-minded people. The acts of its adherents indicate clearly that, as commonly understood, Bolshevism is opposed to constituted law for the protection of life and property. As such, the doctrine is bound to be condemned as a "menace to civilization."

The student of history cannot fail to observe that there is, today, a widespread spirit of reform, either in the political or the economic affairs of nations. Democratic principles are rapidly supplanting autocratic rule, and men are no longer governed and controlled as children. In the evolution of affairs, questions of vital importance demand consideration, and their solution requires the exercise of prudence and the best judgment, in attempting to reconcile the hostility that naturally exists between the different factions of society.

In the present unrest that so disturbs the peace of nations, impulsive action must be controlled by a calm judgment, in the settlement of economic affairs. The doctrine of force to which modern thought has become so attuned must give place to the principles of arbitration and cooperation if conflicting interests are to be harmonized and welfare and progress assured.

BOLSHEVISTIC PRINCIPLES UNSOUND

The more one looks into the theory of Bolshevism, the more confusing it becomes. Its principles and policy are based on the wanton destruction of both life and property. While its followers are made to believe that the aim is to crush autocracy and remove oppression, the truth is very plain that its advocates seek to establish an autocratic rule that disregards the right of another and strives for the overthrow of existing governments and the confiscation of property, both public and private.

Instinctively one knows that the destruction of life and property is morally wrong and vicious, a sheer waste of wealth that cannot fail to bring misery and suffering if permitted. Ruskin has defined the true principles of economics as a system of conduct and legislation founded on the sciences directing the arts and impossible except under certain conditions of moral culture. We find nothing in Bolshevism that conforms to this standard of ethics.

Spencer, that great student of economics, says: Every man has the right to do all that he wills, provided he does not infringe on the equal right of another. Had this principle of action prevailed, there would not be the turmoil and strife that is now rampant throughout the world.

It is a weakness in men to be contentious and harbor a spirit of bitterness against capitalism; but, instead, we should reflect that we are all capitalists to the extent to which our means, talents and energies are used for the production of wealth. It is a fallacy to imagine that reformation can be brought about through any action tending to embarrass capitalism and prevent its functioning for the common welfare of mankind. To destroy capital of any kind or nature is suicidal.

PRODUCTION WOULD BE CURBED

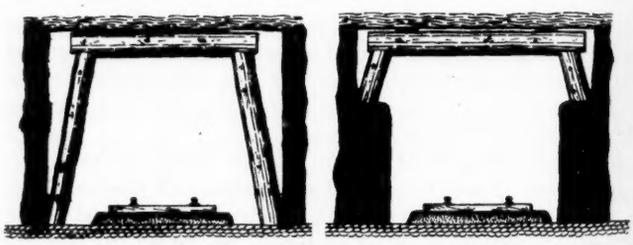
Bolshevism or, I may say, communism is a policy by which capital would be so disciplined as to check production and progress. It is essential to civilization that men shall govern and be governed on a broad basis of equality. The strength of government lies in its ability to so discipline a nation as to insure the protection of life and property, and to legislate for the common interests of the people. To any who are inclined to believe that Bolshevism provides a means of adjusting social and economical errors let me say, in closing, that such a thought is only imaginary and will lead to disappointment.

Ladysmith, B. C., Canada. WILLIAM WESNEDGE.

Safety in Mine Timbering

Letter No. 7—Referring to the method of timbering a haulage road, by supporting the crossbars on siderails held in position by iron plugs that are driven into holes bored in the ribs of the entry, as described by J. Riley, COAL AGE, Sept. 25, p. 541, let me say that, while the plan he suggests is a good one, I very much prefer supporting the crossbars on short legs set in hitches cut high in the ribs, whenever the coal is strong enough for that purpose.

In the accompanying figure I have shown this method on the right, together with the usual form of double timbering on roadways, shown on the left. Supporting the crossbars on



TWO METHODS OF TIMBERING ROADS

short legs, as I suggest, is a method much used in coal mining wherever timber is scarce or it becomes necessary to cut down the cost. While not as good as the old method where the legs supporting the bar rest on the ground, the short-leg method possesses much the same advantages as claimed by Mr. Riley.

Resting the legs of timber sets in hitches cut in the rib eliminates the danger of men being caught between a car and a post standing at the side of the road, or of a derailed car knocking out a post and causing a fall of roof and possibly a fatal accident, besides blocking the road. It also adds much to the safety of mine haulage, where the tracks are well ballasted and drained, which keeps the bottom dry and renders the timbering of the roadway more permanent.

Rawdon, Quebec, Canada. C. McMANIMAN.

INQUIRIES OF GENERAL INTEREST

ANSWERED BY JAMES T. BEARD

Electric Mine Haulage Question

We have in operation, at our mine, a 6-ton, General Electric, double-armature locomotive. The drawbar coupling is at exactly the same height as that on our mine cars, which theoretically should cause a truly horizontal pull on the locomotive. This theory, however, is not supported by fact, in the actual operation of the locomotive, as the front end of the machine appears to lift when pulling a loaded trip. The tendency of the front end to lift causes the wheels to spin and throws the major portion of the load on the rear wheels, with the result that the back motor does practically all the work and becomes overheated, causing much trouble.

The locomotive in use is a single-end control, with the cab and controller on one end and the resistance on the other. Believing that the combined weight of the cab, controller, and operator were not balanced by the weight of the resistance, we turned the locomotive end for end, putting the operator and cab end of the machine in front instead of next to the load, but the results were still the same.

We are now contemplating lowering the drawbar of the locomotive, so that its end will be below the mine car hitching, thinking that this will serve to counteract the lifting tendency by throwing a greater load on the front wheels, thus equalizing both the load and the work of the two motors. Kindly advise if this will accomplish the desired result and, if not, how the difficulty can be overcome.

CHARLES F. SHERMAN, Gen. Supt.,
Peoria, Ill. Groveland Coal Mining Co.

The proposition here presented is an unusual one. It is possible that the difficulty mentioned is experienced when hauling on an upgrade, or when starting a heavy loaded trip. When a locomotive is hauling on a level track, however, there should be no trouble due to the lifting of the front end and consequent overloading of the rear wheels and rapid heating of the motor at that end, provided the locomotive is properly balanced and operated by a competent motorman. The habit of some motormen to accelerate the speed too quickly may have a slight tendency to lift the front end of the machine, or at least throw a greater proportion of the load on the rear wheels and motor. The same effect is caused by hauling on an upgrade.

In the operation of an electric locomotive, the controller should never be moved in a manner to cut out the resistance too rapidly and not giving sufficient time for overcoming the inertia and allowing the motors to pick up the load. The suggestion of lowering the end of the drawbar on the locomotive, so as to cause the coupling attaching it to the loaded trip to give an upward pull would have little effect to overcome the trouble and is not recommended.

There is a very slight tendency, which is almost inappreciable in its effect, for each motor to rotate the machine body in the direction in which the wheels are turning. This effect, however, would have an opposite tendency to that described as the difficulty experienced in this inquiry.

Taking the point of contact of the rear wehels with the rails as the center of moments, it is clear that the moment of the drawbar pull is opposed to the moment of the weight of the machine, acting through its center of gravity. But, as the drawbar pull can only be estimated as, say one-fourth of the weight resting on the drivers, under the best conditions, the ratio of the weight of the machine to the drawbar pull can hardly exceed 4; and, for equilibrium, this ratio must be equal to the ratio of the height of the drawbar coupling above the rail to one-half the wheelbase.

In other words, the half wheelbase cannot exceed one-fourth of the height of the drawbar coupling above the rail, if the drawbar pull is to cause the locomotive to lift at the front end. But the half wheelbase of a locomotive is always greater than a fourth of the height of the drawbar coupling above the rail, which would seem to indicate that the drawbar pull can never lift the front end of the machine, in ordinary mine-haulage practice. However, we shall be glad to hear from others on this point.

Utilization of Pyrite in Coal

Having been deeply interested in reading the article entitled "Coal Pyrite Resources of Tennessee," COAL AGE, Vol 15, p. 1077, I am anxious to secure still further information regarding the extraction of pyrite from coal and its utilization in the manufacture of sulphur. I am particularly interested in securing details of a plant necessary for this purpose and an outline of the methods required to carry on the work. Perhaps some of the readers of COAL AGE will be able to give information of value along this line, as the result of their own experience and knowledge.

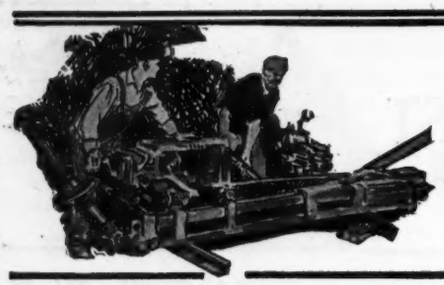
Keelung, Formosa, Japan. K. OHTAKE.

Some time ago, E. A. Holbrook, then connected with the Engineers' Experiment Station, of the University of Illinois, published a bulletin entitled "The Utilization of Pyrite Occurring in Bituminous Coal." The bulletin contains flow sheets, together with estimates of the cost of erecting a plant for the treatment of pyrite in coal. It is probable that this bulletin can still be procured by writing the University of Illinois, at Urbana.

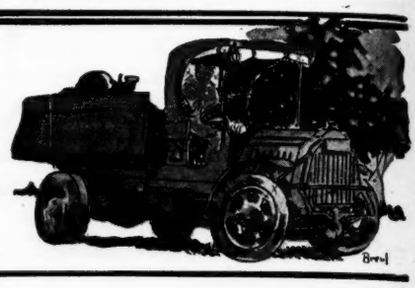
Recently, there appeared in the August bulletin, No. 152, p. 1469, of the American Institute of Mining Engineers, an article by S. H. Davis, entitled "Utilization of Pyrite in Coal." This was a two-page article, which was read at the Chicago meeting of the Institute, September, 1919. An interesting discussion of the article by Edward Hart and E. A. Holbrook appears in the October bulletin, No. 154, p. 2948.

Mr. Davis' article was based on his experience in the operation of a plant under his charge, at Gillespie, Ill. The discussion of the article by Mr. Holbrook included full estimates of what might be considered as the possible pyrite recovery from the coal mines of the country east of the Rocky Mountains and shows a total of 1,456,000 tons of pyrite per year. This estimate is based on data collected by Mr. Holbrook, as engineer of the Federal Bureau of Mines, while engaged in a general investigation of the pyrite resources of the country.

The subject of utilizing the pyrite in coal is one of growing interest and importance, and COAL AGE will be glad to receive further information of value from readers.



COAL AND COKE NEWS



WHAT HAPPENED IN SEPTEMBER

[The bracketed figures in the text refer to the number and the page of the volume in which references to the matter noted may be found, and should the reader desire further information he can obtain it in the place indicated.]

Sept. 1—International mine-rescue and first-aid contest takes place at Nanaimo, B. C., under the auspices of the Vancouver Island Mine Safety Association [XVI-577]—Employees of Canadian Western Fuel Co. receive an advance of 25c a day [XVI-467]—Fourth annual first-aid meet of the Inland, Argyle and Mountain coal companies is held at the Belmont Field in Ebensburg, Penn. [XVI-576].

Sept. 3—H. Y. Saint, head of the export coal department of the Shipping Board, appears before the Senate Committee investigating the coal situation [XVI-451]—Judge Cildress, of Letcher Circuit Court, Whitesburg, Ky., dismisses action brought in important case [XVI-467].

Sept. 5—William C. Redfield, Secretary of Commerce, hands in his resignation to President Wilson. Follows failure of Industrial Board (organized by Redfield) to stabilize prices—Grievance Committee of Powderly, No. 1, and Jermyn colleries, at Carbondale, Penn., meet with Hudson Coal Co. officials without securing concessions, and order general suspension at all mines of the company [XVI-455].

Sept. 6—Miners at larger operations on Kanawha & Michigan R. R., on Kanawha River, W. Va., start an invasion of Guyan Valley. Miners from other nearby points start for points in Boone and Logan Counties. Action taken by Governor Cornwall, of West Virginia [XVI-455 and 456].

Sept. 8—Most of miners who marched to points in Guyan Valley, W. Va., back to work [XVI-456]—Governor Cornwall issues a statement relative to further disorders of recent Guyan Valley raid order [XVI-498]—Some 20,000 men of 30 mining plants of Hudson Coal Co., in Lackawanna and Wyoming Valley, Penn., go out on strike [XVI-455]—An order is issued to start strike of mine workers of Delaware, Lackawanna & Western R. R. Co., Coal Department, to take effect on Sept. 9 [XVI-498].

Sept. 9—Convention of United Mine Workers of America meets in Cleveland, Ohio, to formulate a wage scale [XVI-454]—John Mitchell dies at the Post-Graduate Hospital in New York City [XVI-491]—The Twenty-seventh Consecutive and Fourth Biennial Convention of United Mine Workers of America, meets in Cleveland, Ohio [XVI-496-7].

Sept. 10—Senate Investigating Committee considers export coal situation [XVI-492-3].

Sept. 11—The locals of men employed by the Hudson Coal Co. vote to go back to work on Sept. 13 [XVI-498].

Sept. 12—The committee on Railroad Relations of the National Coal Association and representatives of the United States Railroad Administration held a session at White Sulphur Springs, W. Va. [XVI-552].

Sept. 15—The mine workers of the Hudson Coal Co. return to work [XVI-539].

Sept. 17—The Delaware, Lackawanna & Western mine workers return to work [XVI-539].

Sept. 22—Investigation starts relative to conditions in Guyan field in W. Va.; also raid of Boone County by mine workers [XVI-539]—The American Institute of Mining and Metallurgical Engineers meets at the Congress Hotel in Chicago, Ill. [XVI-606]—Arthur H. Storrs dies at Pelham Manor, N. Y. His home was at Scranton, Penn. [XVI-696].

Sept. 25—The Chicago meeting of the American Institute of Mining and Metallurgical Engineers concludes its sessions [XVI-609].

Sept. 29—The Pittsburgh station building of the Bureau of Mines is dedicated formally at Pittsburgh, Penn. Many notables present [XVI-611].

Sept. 30—The preliminary mine-rescue contests of the national first-aid and mine-rescue meet is held in Pittsburgh, Penn., in conjunction with dedication of the Bureau of Mines building [XVI-614].

PENNSYLVANIA

Anthracite

Hazleton—J. W. Boyle has resumed operations in the removal of the old anthracite culm banks at Woodside, near here, which was a busy place during the war when the demand for fuel was unprecedented. The smaller sizes are again going to market with a rush, owing to the scarcity of bituminous, following failure of the soft coal miners to return to work.

Bituminous

Indiana—E. E. Creps, of this place, has purchased three tracts of coal land in White Township at a cost of $54,369. This deal includes the Margaret D. Gorman tract of 106 acres; consideration $15,994. Another property was the consideration $19,875. The third property was the George Snyder tract of 122 acres; consideration $18,500.

WEST VIRGINIA

Charleston—The mine casualty list of West Virginia for the month of October, according to figures compiled by the West Virginia Department of Mines, numbered 24, and of that total 11 deaths were due to falling slate and coal. The next largest number of deaths followed in the wake of mine car accidents, there being five deaths due to such a cause. One miner was killed by a motor, another was killed by a mining machine and a third was killed by electricity. Deaths outside of the mines from various causes came to a total of five. Nearly one-third of the fatalities, or seven, occurred in McDowell County; Brooke, Fayette and Logan counties had two each. There was one mine fatality in each of the following counties; Barbour, Clay, Harrison, Kanawha, Marion, Mercer, Mingo, Monongalia, Preston, Putnam and Tucker. Sixteen Americans in all were killed as against eight foreigners.

Fairmont—Construction of a short line coal carrying railroad from Flaggy Meadow to the Monongahela R. R. in Monongalia County is presaged by the organization of the Gas Coal Railroad Co., by Samuel D. Brady, a prominent Fairmont coal operator, and associates. The company has obtained a state charter with an authorized capital of $100,000. Among those associated with Mr. Brady in the enterprise are: F. W. Byrne, of Everson, Penn.; Frank E. Peabody, L. P. Monohan and Eugene S. Reilly all of Pittsburgh.

Fairmont — Improvements in and around the plants of mines Nos. 86, 87 and 88 of the Consolidation Coal Co. at Carolina, Ida May and Wyatt, respectively, were made while the mines were shut down during the strike. Streets in the three towns named were graded and cement pavements laid, the work being done by striking miners. A new chute and screen have also been installed as a part of the new tipple equipment at Mine No. 25 of the Consolidation company.

ILLINOIS

Duquoin—The Old Ben Coal Corporation, of Chicago, has just completed the work of sinking another shaft near Pershing, southeast of here, making a total of three mines within six miles of each other, operated by the same company. When about three-fourths of the way down quicksand was encountered, and this delayed the project somewhat, but after it was put under control the shaft was rapidly completed. The mine will be known as Old Ben No. 15, and will be equipped with electric haulage throughout. Work is now being started on the new tipple and engine room, and when the plant is completed it will be one of the principal enterprises of the community.

A deed indicating a $500,000 consideration was recently filed in Jefferson County from the West Frankfort Coal Co. to the Southern Gem Coal Co. (a new organization), conveying thousands of acres of coal lands to the latter concern. The land lies in the northern part of Franklin County and a portion of Jefferson County and extensive mining operations are expected to follow the deal.

The United States Reduction and Atomizing Co. has completed the construction of its large plant near Herrin, Williamson County. The plant, which has been under construction for some eight months, was erected for the purpose of treating the waste products of coal mined in southern Illinois, and is located in the heart of one of the most productive districts in the state. Machinery is now being installed and will soon be ready to begin operations.

The Ernest Coal Co., operating extensive properties near Johnston City, south of here, recently filed papers increasing its capital stock from $100,000 to $200,000. The mine which is operated by the Ernest people has a daily capacity of over 2,000 tons of coal with approximately 1,000 acres of good undeveloped coal land under lease.

Donk Bros. Coal Co. has finished the work of sinking its new mine near Edwardsville, but owing to strike times, no coal has yet been hoisted from the shaft. All necessary work on the bottom has been completed preparatory to operation. When the mine is opened up for work it is expected to employ about 100 men.

Almost without exception the mine owners in southern Illinois mainly in Franklin, Williamson and Perry counties, have all subscribed for the so-called "riot insurance," which became unusually popular during the last three weeks. On account of minor labor troubles here and there at the mines the owners throughout this section bought heavily. One reason of the heavy subscribing is because the premium on the insurance is rather low.

Galesburg—Wagon mines to the west and north of this city are supplying all the coal needed for local use, coal which the Burlington and Santa Fe railroads are unable to transport. There are local mines, the coal from which was supposed to be worthless, and the mines were abandoned several years ago; the people desiring to secure all of their coal from the fields of southern Illinois. Now the wagon mines are busy day and night, and the coal is hauled into Galesburg and to other surrounding towns. Strange to say, the coal which was considered so worthless a few years ago that the mines were abandoned is now found to be good and there is widespread demand for it. There seems to be a future for these wagon mines if they are properly handled by the owners, so that they will comply with the state mining laws and be managed in a conservative and

economical manner. It took the great strike to show to the people of Galesburg how valuable their mines at home really are.

Columbia City—In spite of the growing scarcity of coal, 60 tons of coal at the city power plant at this place have been burning from spontaneous combustion. To throw water upon it would only pack the coal together tighter and spread the flames. The only way the firemen had to save the unburned coal was to dig away to the blaze with shovels.

Hillsboro — Twenty striking coal miners from the Hillsboro district were refused citizenship by Judge Jett in the Montgomery County Circuit Court, who ruled that the men were striking in violation of the laws of the United States, and therefore were not fit for citizenship.

ALABAMA

Birmingham—The United States engineers who have been making a survey of the Mulberry Fork of the Warrior River have about completed this work and, according to H. R. Battle, engineer in charge of the work, it is probable that a recommendation will be made to the Federal Government for the building of a high lift lock near Sanders shoal. Such improvements would render the Mulberry and Sipsey forks of the river navigable for a considerable distance into the coal fields of Jefferson, Walker, Winston, Cullman and Blount counties and ultimately bring about extensive development of coal lands in tributary territory.

Industrial News

Seattle, Wash.—The Black & Decker Co. announces the opening of an additional office on the Pacific coast at 201 Maynard Bldg., at this place. This office is in charge of A. E. Nordwall, who will have charge of the distribution of Black & Decker products in the state of Washington, working under the direction of the main Pacific coast office, 918 Hearst Bldg., San Francisco, Cali.

Bradel, Ky.—The Power Coal Co., of this place, in Knox County, announces a change of name to The Wheeler Coal Co., and an increase in capital from $15,000 to $100,000.

Moundsville, W. Va.—The Fairmont Gas Coal Co. has been incorporated with a capital stock of $300,000. The incorporators are T. B. Cunningham, Connellsville, Penn.; A. J. Salzer, Weston; Z. V. Bartus, Pittsburgh, Penn.; H. H. Staggers, C. E. Hawkes, R. J. Conley, all of Fairmont, W. Va.

Charleston, W. Va.—The West Virginia Eagle Coal Co., of Boomer, W. Va., has been granted a charter with a capital of $1,000,000. The incorporators are: Wm. G. Conley, of Charleston; E. A. Charlton and J. R. Charlton of MacDonald, W. Va.; C. H. Martin and L. S. Tully, of Mt. Hope; of the state of West Virginia.

Seward, Alaska—Fifteen carloads of Alaska coal from the Matanuska fields, near Anchorage, Alaska, have been loaded on the naval collier and radio tender Saturn and will be taken to the Puget Sound naval yard at Bremerton, Wash. The coal was brought here by the United States Government Railway. Seward people celebrated the event, as the shipment was the first of its kind ever taken from here. According to word from Washington, D. C., the navy department expects to develop the Alaska coal beds next year.

Cambridge, Ohio—W. H. Young, of Columbus, has completed the organization of a coal company in which considerable capital is invested. He has secured a lease of a large tract of land north of Lore City, Guernsey County where he says he plans to open one of the largest mines in the Guernsey Valley coal fields.

New York, N. Y.—The Owensboro Ditcher & Grader Co., of this place, announces that it has moved its offices from 222 to 832 Singer Bldg., 149 Broadway New York City.

Fairmont W. Va.—The Dawson-Connellsville colliery is developing its mine at Tucker, near here, and soon will have one of the most important operations in the local field. The capacity will be brought up to 500 tons a day. Frank A. Tarr is president of the company, which already has expended $75,000 in improvements.

Washington, Penn.—The Union Coal and Coke Co., of Pittsburgh, Penn., has purchased from Annie E. Fulton 196.38 acres of coal in Amwell Township, Washington County, for $63,823.50, and from Emma B. Stewart, 137.173 acres, in the same township, for $44,581.33.

Charleston, W. Va.—The Green Brier Coal Co., of Elkins, has been incorporated with a capital stock of $50,000. The incorporators are: W. H. Green, A. F. Martin, J. F. Brown and E. A. Brown, all of Elkins, and R. A. Reid, of Tallmansville.

Toledo, Ohio—The lake season, as far as the Toledo & Ohio Central docks at this place is concerned, was closed Nov. 6. During the season the docks loaded 1,193,626 tons, as compared with 2,124,696 tons during the season of 1918. In 1917 the docks handled 2,343,761 tons. Up to Nov. 15 the Hocking Valley docks, at Toledo, loaded 4,163 408 tons, as compared with 4,990,815 tons in 1918, and 1,764,310 tons in 1917. On the whole, it was a fairly good year for the Lakes, although the tonnage moved was not as large as during the war years just past.

Columbus, Ohio—The Ohio Coal Service Association has been formed with a preliminary capital of $10,000 to develop a tract of 2700 acres of coal lands near Lore City, Ohio on the Baltimore & Ohio R. R. The incorporators are: William H. Young, A. E. Krauss, T. M. Schleesey, Harry Lewis and W. T. Lax.

Personals

Russell W. Stovel, formerly a Lieutenant Colonel of engineers in the U. S. army, has been appointed a consulting engineer of Westinghouse, Church Kerr & Co., Inc., of New York City. Mr. Stovel has had quite a comprehensive experience in the mechanical and electrical problems connected with central power station and steam railroad electrification. He had charge of the Paoli and Chestnut Hill electrifications of the Pennsylvania R. R. and the Elkhorn grade electrification of the Norfolk & Western R. R.

Gardner Pattison, of New York, has been appointed vice president of the United States Distributing Corporation, of New York, to assist George F. Getz, president. Mr. Pattison is one of the prominent figures in the coal trade in the East. He is now chairman of the board of directors of William Farrel & Son; he is best known as one of the firm of the late Pattison & Bowns Co. During the war he devoted a great deal of his time, unofficially, to the Fuel Administration.

Oscar Cartlidge has accepted a position as general superintendent of the Kresge Coal & Mining Co., at Knoxville, Tenn., beginning on his new duties Nov. 24. He will have six mines under his charge, and his headquarters will be at Williamsburg, Ky.

Samuel Steinbach, who was superintendent of the Pennsylvania division of the Consolidation Coal Co., at Somerset, Pa., for ten years, has resigned his position to go with the Bethlehem Steel Corporation.

Colonel W. E. Thompson, of Halifax, has been selected by the Dominion Coal Co. as its representative on the board of conciliation which is to investigate the grievances between the miners and operators of the Dominion Coal Co. **J. C. Watters** has been named by the miners as their representative. It is expected that a chairman will be selected shortly and that the board will commence its sittings.

John E. Crouch, formerly with the United States Fuel Co., at Benton, Ill., which company operates the Middlefork mine at that place, has accepted a position with the Valier Coal Co. at Valier, Ill. The United States Fuel Co. is a subsidiary of the United States Steel Corporation.

Thomas F. Holmes, of Lincoln, Neb., has located in Benton, Ill. where he is general superintendent of a large colliery owned by the Chicago, Wilmington & Franklin Coal Co., of Chicago.

J. E. Hartenfelt, of Chicago, has accepted a position with the Sixth Vein Coal Co., operating near Pinckneyville, Ill.

A. H. Shaw, a coal dealear of St. Louis, has been appointed superintendent of the mine of the Perry County Coal Corporation, at Coulterville, Ill.

L. R. Browning, formerly with the Valier Coal Co., Valier Ill., has accepted a position in the West Virginia fields. Mr. Browning will be employed by one of the largest coal companies in the field.

E. E. Jacobs, formerly superintendent at a mine at Christopher, Ill., operated by the Old Ben Coal Corporation, of Chicago, is now general superintendent for the Southern Gem Coal Co. at the mine near West Frankfort, Ill., which that company recently purchased.

W. C. Westermeier, formerly of the Southern Illinois Coal Co., at Herrin, Ill., is now in the Carlinville, Ill. offices of the Standard Oil Co., near that city. The Standard Oil Co. recently completed a large mine near Carlinville.

Catalogs Received

Bacharach "Easy Read" Pressure Volume Indicator — Bacharach Industrial Instrument Co., Pittsburgh, Penn. Folder. Pp. 4; 6x9 in.; illustrated. Notes use of this instrument in the control of air delivery to cupolas.

Pitot Tubes and Orifices for Measuring the Flow of Gases—Bacharach Industrial Instrument Co., Pittsburgh, Penn. Pamphlet. Pp. 8; 6x9 in.; illustrated. Notes use of special instruments in connection with hydro flow meters.

Electric Air Compressors — Portable Electric Drills—Electric Valve Grinders —The Black & Decker Manufacturing Co., Baltimore, Md. Fall catalogue. Pp. 32; 8½x11 in.; illustrated. Description of Black & Decker air compressors, drills and grinders.

The Nordstrom Lubricated Plug Valve —The Merrill Co., San Francisco, Cali. Catalogue. Pp. 15; 6½x9¾ in.; illustrated. Complete description of the valve.

The Plug Valve That Never Sticks— The Merrill Co., San Francisco Cali. Folder. Pp. 4; 6x9 in.; illustrated. Notes construction and advantages of the valve.

Davis Acetylene Flarelight — The Davis-Bournonville Co., Jersey City, N. J. Folder. Pp. 8; 3¼x6¼ in.; illustrated. Briefly describes the light generator and suggests some of its many uses.

Shops—Westinghouse, Church, Kerr & Co., Inc., 37 Wall St., New York City. Folder. Pp. 8; 8¾x11½ in.; illustrated. Illustrating some of the shops built by this company.

Pintite Rigid Couplings—Smith & Serrell, 90 West St., New York City. Folder. Pp. 4; 6x9 in.; illustrated. Describes the use of the coupling and how installed.

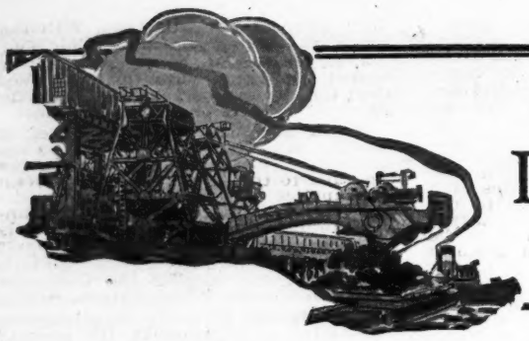
Coming Meetings

The Wholesale Coal Trade Association of New York will hold its next meeting Jan. 20, 1920, at the Whitehall Club, New York City. Secretary, Charles S. Allen, 1 Broadway, New York City.

Northern West Virginia Coal Operators' Association will hold its next meeting Feb. 10, 1920, at Fairmont, West Va. Secretary, George T. Bell, Fairmont, West Va.

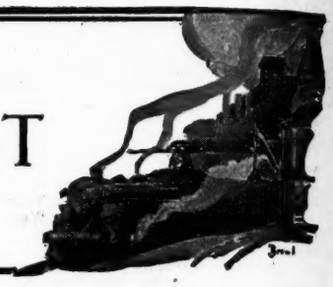
American Institute of Mining and Metallurgical Engineers will hold its next meeting Feb. 16 to 19, in New York City. Secretary, Bradley Stoughton, 29 West 39th St., New York City.

National Conference of Business Paper Editors will meet at the Astor Hotel, New York City, Jan 16, 1920. Secretary, R. D. Hall, 36th St. and 10th Ave., New York City.



MARKET DEPARTMENT

EDITED BY ALEX MOSS



Weekly Review

Soft Coal Market Inactive—Railroad Anthracite in Regard to Coal Purchases Now Rewarded—Much Suffering if Mines Stay Idle Much Longer—Anthracite Situation Favorable.

Market conditions, so far as soft coal is concerned, are lifeless. The output from the non-union mines, upon which the country has been forced to place reliance, is regulated as to price and distribution by the Federal Fuel Administration. Naturally, the railroads are being well taken care of in the matter of supply, as they confiscate whatever coal they require wherever they may find it.

It seems strange that the attitude of the railroad purchasing officials regarding their fuel contracts—an attitude which in great measure is responsible for the present deplorable situation—should be so handsomely rewarded. They have sown the wind. Instead of reaping the whirlwind, they are garnering an ample supply of fuel at prices outrageously low when the law of supply and demand is considered. Thus does the lack of virtue carry with it a material reward!

From present indications it looks as if the conference between the operators and miners' representatives will result in no speedy agreement. In the meantime the reserve stocks of fuel in the hands of the consumers are being depleted rapidly. The output of 300,000 tons weekly from the non-union miners is far below the normal state of consumption. Unless a satisfactory wage agreement is negotiated soon, and all the miners return to work, many industrial plants will be forced to suspend activities. Furthermore, there will be quite a bit of suffering on the part of those domestic consumers, principally in the Middle West, who depend on soft coal for household uses.

Only the large reserve of coal piled up by public utilities and manufacturing plants on the eastern seaboard permit these operations to function to maximum capacity at this time. In the Middle West the situation is not as favorable, for the miners in that section are idle, and little Eastern coal is flowing in. Restrictions in the matter of lighting and public meetings have already been placed, and it is not far-fetched to conclude that even more stringent rules will be enforced if the deadlock of operators and miners prevents the working of the miners.

Anthracite production is well up to normal. The domestic sizes are eagerly sought, with stove coal in most urgent request. Steam sizes, such as buckwheat, rice and barley, are not moving so energetically as was expected. In the face of the lack of soft coal it was believed that consumers would rely more on anthracite.

No scarcity of anthracite need be looked for. The lake season is drawing nigh, and that will divert a large tonnage of hard coal to localities nearer the mines, such as Philadelphia, New York, points on Long Island Sound, and the New England States generally.

WEEKLY COAL PRODUCTION

Bituminous shipments for week ending Nov. 15 were 63,755 carloads, compared with 56,154 of week previous.

Anthracite shipments for the same period were 35,394 carloads, compared with 38,390 of week ending Nov. 8.

Production during the second week of the strike was 33.0 per cent of normal, as compared with 29.4 per cent during the first week. The output of the seven days, Nov. 9 to 15 (including lignits and coal coked), was 3,990,000 net tons. Compared with the week before, this was an increase of 138,000 tons, or 22.4 per cent. The average production during the four weeks ended Oct. 25, which may be regarded as normal, was 12,089,000 tons.

Since the strike order was withdrawn on the afternoon of Tuesday, Nov. 11, the week contained two days during which the order was in force and four days after it had been withdrawn. Production was not resumed during the week on a considerable scale, except in scattering districts outside the Central Competitive Field.

During the second week of the bituminous strike the anthracite mines failed to maintain their recent high level of production. The output is estimated at 1,818,000 net tons. Compared with the corresponding week last year, when the influenza epidemic and the celebration of the armistice cut heavily into production, this was a substantial increase. Compared with the preceding week, however, it was a decrease of 154,000 tons or 7.8 per cent. Indeed, the output was the lowest reported since Sept. 13, with the single exception of the week of All Saints' Day.

In the Central Competitive Field the strike was practically 100 per cent effective. Virtually no coal was mined in Illinois, Indiana, Michigan, Ohio and the Pittsburgh district, the only exception being insignificant tonnages from wagon mines, stripping pits and certain co-operative mines.

In the tier of states immediately west of the Mississippi—another stronghold of unionism—the tie-up was also practically complete. From Iowa south to Oklahoma, about 99 per cent of the capacity was closed. In Texas alone of the southwestern states, where incomplete returns indicate a production of one-third of capacity, was the proportion remaining at work significant.

In the northwest, North Dakota lignite mines continued to work during the first days of the strike, but closed down on Saturday. Operations virtually ceased in Washington and Wyoming. In Colorado 87 out of 108 mines lost time because of labor troubles, either directly through the action of their own employees or indirectly, as a result of the steel strike. The total production for the week was less than one-third of capacity. Of the Mountain States, Utah and New Mexico alone reported fairly continuous operation.

Of the districts to the east and south of the Central Competitive field, those which had been recognized as non-union, remained at work. The Connellsville, Winding Gulf, Pocahontas, Tug River, Logan, Kenova-Thacker and Hazard fields were virtually untouched by the strike. Fractions of the Westmoreland and Somerset fields were idle, not sufficient, however, materially to reduce their output. Seven operations idle in the St. Charles district caused a loss of tonnage in southwest Virginia amounting to 8.3 per cent of capacity.

Other fields in the Appalachians which have been recognized as union went out. The greater part of Central Pennsylvania, nine-tenths of Kanawha, practically all of Fairmont, New River and Cumberland-Piedmont were down.

Interest centered in the open-shop fields which up to the day of the strike were debatable ground. The reports now indicate that during the first week of the strike Alabama was working at about half capacity, and Western Kentucky at about one-third. The Butler-Mercer field, in Northwestern Pennsylvania, appears to have been closed down almost completely. Three-fourths of the capacity of the West Virginia Panhandle field was tied up by one form of labor difficulty or another. In Northeastern Kentucky the larger operations, embracing 70 per cent of the capacity, were down. Except for two properties all of Harlan County was down, and no large operations in Southeastern Kentucky and Tennessee were reported to the Southern Appalachian Association.

In all, approximately three-fourths of the country's capacity was paralyzed during the first week of the strike.

The closing of so many mines afforded to the others which remained at work exceptional car supply. Thanks to the efforts of the railroads, transportation disability as a limiting factor practically ceased to exist. The only district which reported serious shortage of cars was the small Hazard field of Kentucky, where losses were attributed to car shortage amounting to 20.2 per cent. There is little doubt that the percentage of loss on account of car shortage for the entire country

will be found to be less than one per cent, quite the lowest ever recorded in a period of active demand.

The losses due to "no market" reported from Colorado were confined to a group of mines whose output is commonly taken by the steel industry.

In marked contrast to the great drop in the production of coal, the production of beehive coke has increased during the strike. The total output during the week ended Nov. 15 is estimated at 398,979 net tons, a figure greater than the preceding week by 23,803 tons or 6.04 per cent. The most notable increase occurred in Pennsylvania and Alabama, but all districts reported larger tonnages except West Virginia, Washington and Utah.

A number of factors contributed to the larger output of coke. The great majority of the beehive ovens of the country lie in districts unaffected by the coal strike. Closing down the union mines created an ample car supply for those fields which remained at work. The gradual resumption of operations in the steel industry caused an active demand for coke. The fact that the wartime prices have been restored for coal, but not for coke placed a premium upon the conversion of coal into coke at the mine.

With the total production of coal far below normal and the production of beehive coke increasing, the proportion of the entire bituminous output now going into the manufacture of coke is without precedent. Whereas prior to the strike the beehive ovens consumed only 6 per cent of the 1919 production, since the strike began they have been taking 15 per cent of all the soft coal mined.

A limited tonnage of coal has been allowed to move to the Lakes since the beginning of the strike. The total quantity dumped at lower Lake ports in the two-week period ended Nov. 17 was approximately 370,000 tons, which was less than one-fourth as much as during the corresponding period in 1918.

Total dumpings since the opening of the season are reported as 22,240,000 tons, or roughly six and two-thirds million tons below those of the corresponding period last year.

Atlantic Seaboard

BOSTON

Market continues inactive. Buyers only mildly interested in current developments. Limited tonnages being offered from union mines. No instance yet of confiscation. Coal being moved over Philadelphia and New York piers on permit. Norfolk dumping almost normal, but New River ouput light. Tonnage in less demand. Anthracite practically unchanged. Signs of easing up on Egg.

Bituminous — Notwithstanding the threatening nature of newspaper reports, the New England market is without any urgent demand for steam grades. It is probable that if light production continues there will be developed some spot business during December, but trade at this writing is as inactive as last spring. A few cases there are of small consumers who will need coal from week to week, but in every instance the coal is forthcoming usually from some local dealer, and we have yet to hear of anything approaching distress for bituminous coal in any part of the territory.

Most of the larger buyers are comfortably supplied for a considerable period, and there is a large amount of indifference over the issue of present labor discussions. On many of the contracts coal is actually being shipped from day to day, and quite naturally this has a soothing influence upon steam-users generally. Were all shipments shut off if only for a week, it is likely there would be a distinctly different attitude. As it is, the market is being canvassed by sales agencies very much as in normal times, and with stocks still in excess of the 60-day mark it is difficult to rouse any interest in a long continued suspension at the mines. It is felt so strongly that public opinion will not support the demands of the mine-workers that there is no pronounced uneasiness over the conference now being held at Washington. Very evidently the union organizations in the different districts are not holding together as it was feared they might.

Coal is now being offered freely from a large number of union mines where the men have returned to work the past week. The proportion of men at work is by no means even, and for that reason the output is undependable, but the fact that even limited tonnages can be sent forward is an encouraging sign. The government figure is of course the only price mentioned on new sales, and there is always the uncertainty whether the railroad and fuel authorities will allow the coal to be delivered to the original consignee. The actual carrying out of regulations assumed to be in force has been other than uniform in this section, and where the railroads here are so well looked after it seems idle to tie up indefinitely so many cars as are now being held at destinations throughout New England. One would suppose it would all have a bearing upon car supply a little later when a wage agreement is reached.

Thus far, in New England, we have heard no cases of actual confiscation of coal destined for commercial use. The cars have simply been held pending developments, and in the few instances that have come to our notice where food plants, etc., have asked for relief the regional committee has declined to seize any of these shipments merely for the purpose of helping out some consumer who has been less forehanded. There is enough tonnage in the hands of retail distributors to meet any case of actual need.

A moderate tonnage is being dumped over the various New York and Philadelphia piers, but almost exclusively on permits issued through the Railroad Administration and for requirements on the list of priorities. Coal for retail dealers is included in this list as well as for coastwise bunkering and other essential needs, and the result is that the car congestion of a fortnight ago has now cleared up. The Georges Creek and Fairmont districts have an especially large proportion of men at work and the Baltimore piers have about resumed their normal activity, even though most of the coal is destined offshore.

At Norfolk the usual tonnage is now being dumped, although it is possible that by weeks the average is less than normal. New River output continues light, and for that reason there is a heavier demand upon the piers at Norfolk. Reports from New River are more favorable this week and the agencies here are expecting much better returns in another week.

Coastwise tonnage is in somewhat less demand than a week ago. Up to now there has been enough anthracite business to make the call for steamers rather urgent, but now that bituminous buyers are less apprehensive over supply for the near future, there is a small surplus. Enough coal is coming forward all-rail to take the edge off the demand for prompt coal by the water routes.

Anthracite—Domestic sizes, especially stove and chestnut, are in urgent request. A fair tonnage has come to New England this season; the difficulty is that it has not been distributed as equitably as usual. This is largely because of the strikes of marine workers, engineers, etc., which have kept a very considerable part of the anthracite-carrying fleet out of commission practically three months of the season when the heaviest tonnage is moved. The result is that Boston Portland, Providence and other points where there are facilities for discharging anthracite from steamers have been favored with more than their just quota, while ports where there are no such facilities, have suffered because of the lack of barges.

There are beginning to be signs of less retail demand in some of the cities. This is shown in the decreased call for egg size. All the shippers now have a surplus of this and it is becoming increasingly difficult for retailers to accept the large proportion that they are urged to take. The soft coal labor troubles have had the effect of cleaning up much of the steam size anthracite that dealers have been carrying over from last year. There is still almost no demand for the different sizes of buckwheat at wholesale. The shortage of stove and chestnut is due in part at this time to the heavy movement to the lakes before navigation closes.

NEW YORK

Domestic coals rushed westward. Anthracite steam coals used to augment bituminous stocks. Demand for these coals increase but prices remain steady. Bituminous moves slowly in this market. Manufacturers have large stocks.

Anthracite—The eastern section of the country is not receiving all the domestic coals it can absorb, but this has been due to the demand from the West for supplies before navigation on the lakes close this week. In the meantime, this market has not been entirely neglected and no one has suffered from the lack of coal. The New England market is also out for a large tonnage and this will be better taken care of next month.

Shippers of anthracite look for a heavier demand for the domestic coals from the west than they would expect if the soft coal mines were operating, but even this demand will not be anything like the tonnage now being sent over the lake routes.

Local dealers are able to absorb all the egg, stove and chestnut they can obtain, but there is no shortage. Everybody seems to have some coal in the bins, and dealers do not look for any pressure for deliveries this winter.

One of the surprises of the local trade is the demand for chestnut coal, which, according to some dealers, is unprecedented even for the New York market. During the summer and early fall the dealers could not get rid of a comparatively small tonnage, but during the past few weeks it has been difficult to meet the demand, which has consisted mostly of small orders and the efforts of the peddlers to fill their bins.

Pea coal is moving steadily and middlemen who, a few weeks ago were complaining of the quantity of this size on hand, are now looking for cargo lots for quick delivery.

Inquiries for the steam coals have steadily increased, but prices are firm. There seems to be plenty of these coals to meet all urgent demands, and some shippers are urging part cargoes with shipments of the domestic sizes. With few exceptions all grades are bring company prices, the exceptions being in washery coals and the poorer grades of barley.

Dumpings of anthracite during the 7-day period ended Nov. 21 were 5,916 cars, as compared with 5,583 cars the previous week.

Retail prices remain the same.

Bituminous — Local manufacturers seem to be unconcerned as to when the strike ends. Most of them have large stocks of coal in their yards and have, so far, been able to keep their power up on their daily deliveries, although the shipments are being regulated by the Federal authorities. Many have augmented their fuel supply with the anthracite steam coals.

There is no lack of coal at the docks in this harbor because of the rules governing the exporting and bunkering of vessels. Reports of the Railroad Administration show that on Nov. 21 there were 4,330 loaded cars at the loaded docks, which was 1925 cars less than on November 14.

With production slowly but surely increasing, shippers here expected a gradual loosening up in the regulations governing the issuance of permits. The reports from Washington regarding the possible settlement of the strike caused little comment here, except that some coal men said that the offer of the operators' committee of a 15% increase would mean a heavy addition to the payrolls.

Operators and selling agents who visited the coal fields last week said that the mine workers on strike were enjoying themselves immensely by making hunting expeditions, and that they did not seem to be worrying over the outcome of the strike. They were not disappointed at the small number of men who returned to work when the strike order was rescinded by direction of the Federal courts.

Should the strike continue for a few weeks more fear is expressed by the officials of some of the public service corporations here that there might be a repetition of the scare experienced during the cold spell of the winter of 1917-19,8. It was stated, however, that some of the gas and lighting companies have sufficient stocks in reserve to last them for about six weeks.

Locally, the situation is quiet. Shippers are not being pushed for deliveries, and there is comparatively little movement of coal for either export or for bunkering purposes. The labor troubles of the longshoremen and boatmen, which it was thought had been settled, threatens to break out anew, because of dissatisfaction with the awards given them by the adjustment commission.

There were 266 cars of bituminous dumped at the local piers during the 7-day period ended Nov. 21, as compared with 5081 cars the previous week, an increase of 185 cars.

PHILADELPHIA

Anthracite trade stirred by freezing weather. Pea coal called for in good volume. Stove and nut is the cry of the trade. Fair shipments during the past week. Improvement promised Dec. 1. Outside territories to be cut down. Steam coals brisk, with even barley picking up. Bituminous grows scarcer. Little resumption of work in Pa. district. Little spot coal.

Anthracite—A week of freezing weather has served to impress every one with the need of more coal. In a manner the retail dealers welcomed the coming of seasonable weather, as it gave them a chance to cut into their pea coal stocks. There is more than one dealer who now feels that even with the good tonnages on hand there will be a time when they will wish they had more. The big company shippers are not at all backward in saying that in the course of about ten weeks this size will actually be scarce. The quantity in the storage yards is merely negligible and is being rapidly removed to meet current calls from the trade.

The cold weather also caused an increased demand for the larger sizes, particularly stove and nut. The quantity of these sizes on hand to meet the demand has been at all times extremely limited, and the dealers took advantage of the occasion to urge their customers to take some pea coal. As a fact, if it hadn't been for the stocks of pea coal, more than one dealer would have had his equipment idle for the lack of coal of any size. In many instances it took a good deal of persuasion to induce some customers to take pea, as they are firm in their demand for stove and nut. This is particularly true of consumers who heretofore have never used anything but pea, and this situation has caused much comment in the trade, and is explained on the theory that these folks have the price and are bound to enjoy the luxury of the larger size. However, usually by recalling the scarcity of coal of any size during the war winter, most of them are willing to unbend enough to take a little pea.

Stove and nut continues to be the one cry of the trade. Practically all the calls at the shipping office, in person or by letter, ask for these two sizes. Despite the fact that the operators state that they will never be able to meet the demand, the dealers are none the less firm in presenting their need for these sizes. On the part of the consumers the demand is shifting quickly to nut, and this size is now more desired than any other. There is still a lively call for egg, but not in the same proportion as existed a few weeks since.

The receipts of the large sizes have only been fair, and a tour of the city shows coal yards in about the same condition—big bins of pea coal and bare boards showing in the other bins. At this time some of the large shippers are holding out promises of better shipments beginning with the first of the month. Word has been passed out that shipments to the lakes will have entirely ceased by this time, and that in addition the orders have been sent out to cut down the supply to New England. It has been definitely stated that the local market is then to receive better treatment, but the dealers are warned that even then they must not expect to be flooded with these sizes.

With the likelihood of the bituminous strike being settled by an increase of wages being granted, the local anthracite trade is beginning to wonder what effect it will have on the miners in this trade, who have agreed to work on the war agreement until April. By some it is suggested that since the bituminous scale has been changed, it will likely cause some uneasiness among the anthracite workers, as the scale in the other district will be higher than theirs.

The fact that the fuel administration has ordered all exports of anthracite to stop will have little effect on the domestic market, as this order does not affect Canada, which country takes by far the greater percentage of exported coal. With that exception the shipments outside the country never have been sufficient to leave any impress on the market.

The steam coals are looking up very well and buckwheat is in strong demand with heavy shipments coming out of storage. If it were not for the big washery operations, which are now operating in good force, there would actually be a shortage of buckwheat. Rice coal is also being asked for in such quantity as to keep the shippers on the jump to fill orders for it. With the continuance of the bituminous strike barley coal is at last beginning to show more than ordinary movement, and should the situation continue this way for another two weeks this will be a hard size to procure.

Bituminous—The only real change in the bituminous trade is the growing scarcity of fuel in this market. The shortage of fuel is still far from the serious stage, but the accumulations in the pools are becoming diminished. This is due to the diversion of coal that usually comes to this market to western points, particularly gas coals from the Fairmont region, where the resumption of mining has been greater than in the Penn. districts. There is still a fair quantity of fresh-mined coal being offered by some commission houses directly to the trade, but usually these are low grade fuels and sales are not easily made, and for the further reason that no shipper is able to assure delivery even after an order is taken. With the coal all being distributed according to the priority list issued by the administration, putting public service plants on the bottom of the lists, all ordinary lines of industry are practically shut out from the operations of the salesmen.

At tide there is a heavy congestion of coal, as the foreign business has ceased under the ruling of the authorities and all of the coal standing is now being used for distribution on approved calls from the fuel directors.

Operators in the central Penn. field having offices in this city report that there is very little activity at their mines, as the expected resumption last Monday failed to materialize. Even if they were able to procure anything like their full working forces there would likely be considerable idleness on account of lack of cars, as so much of the equipment is tied up at destination loaded with coal.

BALTIMORE

Situation still complicated. Movement through Cumberland gateway increases. Troubles exist at a number of mines despite return order.

Bituminous—The situation here remains somewhat confused. On one hand talk comes through of shortages of coal in many sections of the country and with it comes an embargo against shipment to the piers here because of the jam of fuel already at tide. At Curtis Bay, Canton and Locust Point, at the outset of the past week, there were about 6,000 cars of soft coal, and this caused the embargo order. At that time there was agitation for a release of some of this fuel to export account. It is expected, however, that it will be held for use in other sections as needed. Meanwhile, there continues a limited distribution here under the permit plan.

The movement through the Cumberland gateway continues to improve, the present daily run being about 1,200 cars against about 700 at the end of the week previous. The usual normal run through the gateway is about 3,800. Troubles are reported at some of the mines despite the fact that the mandate of the court brought back some 80 per cent in many sections. In some sections of the state there were reports of dissatisfaction over the work assigned to some of the men who returned, while in others there was a dispute over a fine for failure to go to work, and the miners held a big meeting at Frostburg to discuss the situation.

Anthracite—The run of hard coal to this city is improving. The past week was mild and the demand from belated purchasers was light, so that the trade was able to keep well abreast of conditions without drawing on meager yard supplies. The colder weather came toward the end of the week and unless there is an improvement in the movement things will be tight in the near future.

Lake Markets

PITTSBURGH

Union mines still closed. Cancellation of rebilling order makes trouble. Consumers fairly comfortable.

There has been practically no return of miners to work at union mines in the Pittsburgh district in the past week. A union mine is defined as one that has the check-off. There are various other mines where union men are employed, and there are working variously, in general better than a week or two ago, while the strictly non-union mines are working full time. The Connellsville region, not a part of the Pittsburgh district proper, is probably producing more coal than ever; about half the coal being shipped, the other half being converted into coke.

The local coal trade is disturbed over the order just issued by the Fuel Administration, cancelling the rebilling charge of 15c, previously allowed, and making the cancellation order retroactive to Oct. 30.

There is not much activity in the local coal market. Well-connected brokers are generally able to pick up a few carloads daily, chiefly from non-union mines. A difficulty is that coal shipped on such sales is not always delivered, as the distribution authorities may seize it.

Large consumers of coal are getting along fairly well, chiefly by reason of their stocks. The steel mills, with occasional exceptions, had large stocks. There are about 3000 carloads of coal at Youngstown, releases being made when the prospective consumer proves that the coal is urgently needed.

We quote the market at government prices: $2.35 at $2.50 for mine-run and 25c higher for screened, per net ton at mine; Pittsburgh district.

BUFFALO

No change in the local coal situation. Bituminous plenty. Jobbers uneasy. Anthracite moving fast by lake.

Bituminous—The local trade is decidedly impatient, waiting to see which way the situation is going to turn. As it appears now almost any hour may turn out something that will shape the future of the trade. So long as there is no understanding between the operators and the miners almost anything may happen. There was seldom so much uncertainty at a time when so little is actually happening.

The strike is apparently having some effect in other districts, but that must have been because the shippers did not take care of consumers as well as they did here. The amount of coal available, with the great stocks on hand, is sufficient to keep everything here going a month or more. Many nonunion mines are running, and they turn out coal enough to supply consumers with small storage capacity. So far as can be learned not a single consumer is short, or likely to be right away. It is a strange state of things and cannot last very long.

There is neither demand nor coal to fill new orders if they should come in. Shippers are sitting still and doing nothing. Small operators ship coal promptly, though always with the supervision of the Government and railroad authorities, which in this case is about the same thing. In general, the belief is that the strike will end soon. However, the determination of the strikers not to go back to work till a new scale is in force does not look pleasant.

Bituminous prices are little more than nominal now, for no effort is making to shape them. Quotations remain at $4.55 for Allegheny Valley sizes; $4.80 for Pittsburgh and No. 8 lump; $4.65 for same three-quarter; $4.20 for mine run; $4.10 for all slack; $4.60 for smokeless; $5.70 for smithing all per net ton.

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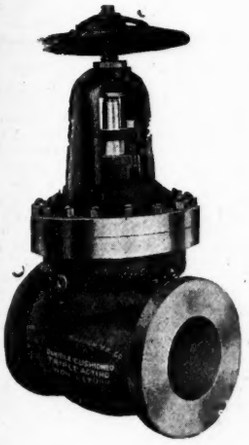

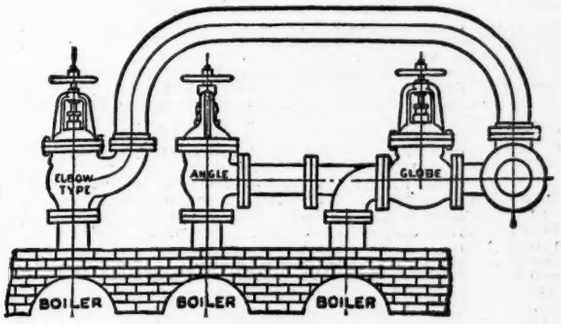

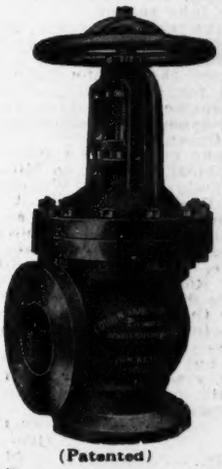

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1st. Prevent expensive shut downs.

2nd. Make back flow of steam impossible.

3rd. Equalize pressure between boilers, automatically—quickly pay for themselves in reduced coal bills alone.

4th. Absolutely protect men inside of "dead" boilers.

5th. Valves fitted with "Double Corliss" dashpots. Absolutely cushion valve—no hammering or sticking.

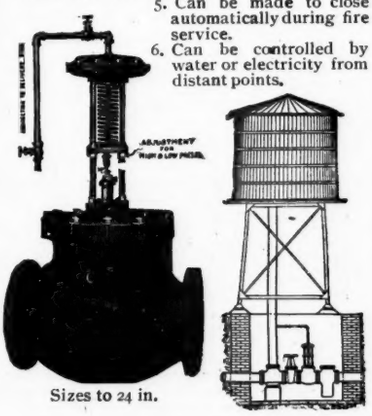
6th. Provided for every contingency by "automatic" testing in service feature—valves closed from floor or remote points.

7th. Heaviest and most correct mechanically constructed and operated automatic valves made.

GOLDEN-ANDERSON

Automatic Cushioned Controlling Altitude Valves

1. Eliminate loss of water in reservoirs, standpipes, tanks, etc., by keeping the level constant.
2. Operate without floats or fixtures.
3. Uninterrupted service and a positive water supply assured without danger of water hammer surges or burst mains.
4. No metal to metal seating. Positive cushioned by water and by air.
5. Can be made to close automatically during fire service.
6. Can be controlled by water or electricity from distant points.



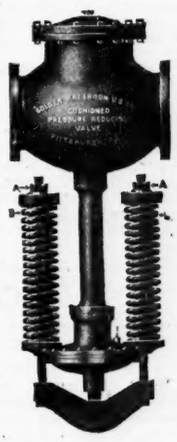
Sizes to 24 in.

GOLDEN-ANDERSON

Automatic Cushioned Steam Pressure Reducing Valves

Extra Heavy "For High or Low Pressure Service"

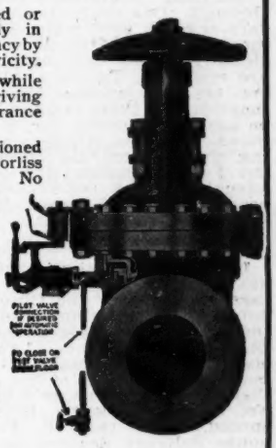
1. Automatically keeps the reduced pressure perfectly constant even if the boiler pressure fluctuates.
2. Once adjusted it stays adjusted.
3. Thoroughly cushioned and guided. No pounding, jamming or chattering.
4. A patent safety piston absolutely prevents high pressure steam from penetrating into the low pressure side in case of a broken diaphragm.
5. Double extra heavy and practically indestructible and foolproof.



GOLDEN-ANDERSON

Double Cushioned Quick Closing Emergency Trip Valves Provide Against Runaway Engines and Disastrous Accidents

1. Give perfect automatic control of the steam or air flow in any pipe line from one or more distant points.
2. Can be opened or closed instantly in case of emergency by steam or electricity.
3. May be tested while in service giving complete assurance of safety.
4. Positively cushioned by double Corliss Dash Pot. No banging, sticking or chattering.
5. Contain no springs or tight fitting parts.
6. Can be adapted for automatic closing in case steam pipe bursts.
7. Double extra heavy and virtually indestructible.



"Host of References"

Golden-Anderson Valve Specialty Co., 1213 Fulton Building PITTSBURGH, PA.

Anthracite—The supply is still going to the lakes, only one company having closed up that trade and turned to the rail lines. The season is nearly at an end. So far as anthracite is concerned there ought to be sufficient for the needs of the upper-lake district, though bituminous coal may prove to be short. The lake tonnage is plenty, as other freights did not last till the end of the open lake season.

Lake shipments for the week were heavy, totaling 165,800 tons, of which 94,700 tons cleared for Duluth and Superior; 28,800 tons for Chicago; 14,300 tons for Fort William; 14,100 tons for Milwaukee; 7000 tons for Waukegan; 4000 tons for Manitowoc, and 2900 tons for Green Bay.

Lake coal rates remain weak at 60c. to Chicago; 47½c. to Milwaukee; 42½c. to Duluth, Fort William Waukegan and Green Bay.

The local supply of anthracite is as small as ever, but there is promise of a more liberal supply as soon as the lakes close. A single week of the amount now going up the lakes would make a large difference here, and that was the way the supply was turned in last year.

Natural gas is ordered out of all furnaces that can burn coal, effective Dec. 15, but it is expected that the coal supply will be in before that time.

City prices of anthracite remain as follows:

	On Cars Gross Ton	At Curb Net Ton
Grate	$8.55	$10.20
Egg	8.80	10.65
Stove	9.00	10.85
Chestnut	9.10	10.95
Pea	7.05	9.30
Buckwheat	5.70	7.75

COKE

Buffalo—Trading is dull on account of the small consumption during the strike of steel workers. The condition of the furnaces is now practically normal, but so much time has been lost that considerably less than the usual amount of iron ore has been brought down by lake. Prices remain dull on the basis of $8 for 72-hour foundry; $7.50 for 48-hour furnace; $7 for off grades; $7.75 for domestic sizes and $5 for breeze, all per net ton, f. o. b. Buffalo.

CLEVELAND

Bituminous coal stocks have melted away. Domestic consumers are being rationed. Less than 20,000 tons of coal are now in dealers' yards.

Bituminous—So little bituminous coal has been coming through the railroad blockade that the local committee in charge of distribution has denied this grade to all industrial plants. Not even fuel enough to keep pipes from freezing is permitted, as warning has been given all industrial plant officials to save enough for this emergency out of their present piles. A visit to leading retail coal yards reveals about 20,000 tons on hand, barely enough to keep utilities, office buildings and other essentials going.

No lump bituminous coal is coming through. One dealer is getting 30 to 40 cars of slack each week, but this is not more than one-fifth of normal. Occasionally a few cars of prepared sizes are received. To the retail trade dealers are not quoting bituminous prices, inasmuch as there is none to sell, while no new committments for steam coal are being taken on. Dealers are complaining that the margin allowed them by the Fuel Administration is wholly inadeuate. Wages, for one instance, have been advanced $5 a week since war time. Other cost increases have easily wiped out all profit in handling bituminous, they assert.

Under the wartime schedule, which has been restored, slack is $2.35, f. o. b. cars at mines in the Ohio No. 8 field. Jobbers' commissions come at 5c. a ton, while the freight from Southern Ohio to Cleveland is $1.40. On steam coal the dealer's margin is $1.58. This makes slack $5.48 a ton delivered in Cleveland. This paper's quotations on No. 8 slack recently have given the spread as $5.10 to $5.50. For apartment house delivery dealers are entitled to 57c. more and to residences 72c. more.

With industrial plants entirely cut off, the local distribution committee estimates enough bituminous is coming into Cleveland to meet demands of utilities and food companies. Railroad fuel stocks stored outside of Cleveland are dwindling fast, and another ten days will see train service curtailed. One big industry already is on half-time schedule, while scores more will be forced down within a week or ten days.

Pocahontas and Anthracite—In the past week practically no Pocahontas has been received because of poor car service, but the coming week is expected to see near-normal shipments. Anthracite too, has fallen away off, and dealers consider themselves lucky when they get a car. In substitution of these grades retail dealers are offering coke at $11. The cut in these grades of coal is regarded as temporary.

Lake Trade—No more bituminous coal is being loaded for Lake Superior ports, but some ¾-in. lump for engine fuel is being consigned to Lake Michigan ports. Last week Lake Erie docks dumped only 304,319 tons of bituminous and 15,118 tons of vessel fuel, a grand total of 319,437 tons—about 25 per cent of normal. Dumping of more than 500 cars a day at Lake Erie ports has been the exception lately. At most lower lake ports Nov. 22 was the windup of the bituminous season.

DETROIT

Bituminous coal receipts fall short of normal, but meet present needs.

Bituminous—Consumers of steam and domestic bituminous coal in Detroit are not suffering any hardship due to shortage. The uncertainties created by continuance of the mine strike occasions some anxiety, however, as to the future. The regional committee in charge of local distribution is endeavoring to avoid as much as possible any interruption of the movement of coal to buyers. Where the buyer is not in immediate need of additional coal, shipments are held on cars. This enables the committee to supply quickly any consumer whose need is urgent.

Few reports have so far come to jobbers indicating hardship due to lack of coal. Most of the Michigan towns outside Detroit seem to be quite comfortably fixed in the matter of supply. The exceptions are chiefly places that have been almost wholly dependent on the product of Michigan mines and where it has been customary to buy on a day-to-day basis.

The regional committee's distribution plan, it is explained, does not tend to create a shortage of cars at the mines, as the cars are unloaded with sufficient promptness to maintain transportation facilities, at mines that are continuing in operation. In the work of distribution, consideration also is given to the fact that some public service companies find it necessary to maintain stocks sufficient to assure operation 10 days or more ahead.

Anthracite—No noticeable improvement has appeared in the matter of anthracite supply. Stocks in yards of retailers are low and are not being renewed with a promptness that encourages confidence in adequacy of the supply. Dealers report that long delays are experienced after orders are placed before shipments arrive. Any sudden lowering of temperature would be likely to bring a pressure of demand that would exhaust supplies of prepared sizes.

Lake Trade—Coal is not coming forward to lake loading docks very freely. Shipments are small. Some are reported as diminishing in size. Some lake vessels are even finding it difficult to get sufficient bunker coal for their needs, though requirements for this purpose have been greatly reduced by the fact that a large proportion of the lake fleet has been sent to winter moorings, due to the lack of freight cargoes.

Coke

CONNELLSVILLE

Spot furnace coke market higher. Asking prices higher on contract. Consumers willing to pay higher prices.

The coke market continues to grow stronger, and the stiffening in the past few days has been particularly noteworthy, this applying both to prompt coke and to contracts for all or part of 1920. Sales of spot furnace coke are reported at $6.25, and while this may not be the minimum of the market, the average is certainly higher than a week ago, as then there was a possibility of shading $6 a trifle. In foundry coke, however, there is no higher market for prompt. Demand, which was produced by consumers desiring to accumulate stocks, has fallen off from its high level. Now consumers are buying no more than enough for current requirements, and perhaps not as much, since there are suspicions that some consumers are drawing from stocks. The outside prices are no longer in point but the $7 minimum for standard brands remains.

Coke operators' views as to 1920 contracts for furnace coke have experienced a further elevation, while the blast furnaces that must buy Connellsville coke seem quite reconciled to the payment of much higher prices than obtained for the current half year, the average having been about $4.25. The only uestion is how great the advance is to be and how prices shall be determined. Ratio contracts are being considered, at 5 to 1 on basic pig iron, valley, last ratio contracts having been at 6¼ to 1. With basic pig iron at $30, valley, as at present, 5 to 1 contracts would make $6 coke, with higher settlement prices in prospect. It is reported that $6.25 flat was done with two eastern consumers for the first half of 1920. Some operators are proposing a contract with a flat price, based on present costs, the price to advance by whatever percentage the wage cost increases.

The market is quotable at $6@6.25 for spot furnace and $7@7.25 for spot foundry, per net ton at ovens, contract prices being unquotable.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ended Nov. 15 at 253,924 tons, an increase of 5248 tons.

Middle West

MILWAUKEE

No excitement in the coal market because of the mine situation. Stocks will be ample for the winter unless there is requisitioning by the Government. Prices unchanged.

Milwaukee coal dealers are not allowing themselves to become excited over the possibility of a serious coal famine pending the adjustment of the labor situation at the mines. Several are now in the East doing what they can to send coal this way. Dealers have been ordered to suspend the preferred customers' lists, so that there will be an equitable distribution of coal and supplies intended for parties with fair stocks on hand are being diverted to other points where fuel is needed.

"Milwaukee has coal enough to last until Spring," said a leading shipper, "but in case of prolonged period of idleness at the mines, the Government may requisition some of the coal on the docks for the benefit of interior points." The Milwaukee road has taken off a number of trains in order to conserve the supply of fuel. Prices continue unchanged. Receipts by lake are slow, and the wind-up of the season promises to be weak in this respect. The total receipts by lake thus far aggregate 832,490 tons of anthracite and 2,836,325 tons of soft coal, a gain over last year of 168,642 tons of anthracite and a loss of 495,019 tons of soft coal.

ST. LOUIS

Coal supply exhausted. Consumers falling back on coke supply. Conditions growing serious.

The local condition is beginning to give considerable worry. The coal stocks are nearly depleted there being practically no storage coal in the city, aside from that held for steam purposes by the gas company and one or two large manufacturing plants.

Office buildings and factories that were unable to obtain coal are now using coke breeze and other sizes of gashouse coke. In a few instances byproduct coke is being consumed.

On Nov. 22 there were about 60,000 tons of byproduct coke stored in St. Louis. This, however, is being loaded out at the rate of 3000 or 4000 tons a day. About 30,000 tons of gas coke were also held in storage. Five per cent. of this entire tonnage is made up of coke breeze.